PRUEBA DE HABILIDADES TRABAJO FINAL CISCO

JULIANA ANDREA PALACIO DURANGO

GRUPO:
203092_28

UNIVERSIDAD NACIONAL Y A DISTANCIA - UNAD
DIPLOMADO DE PROFUNDIZACIÓN CISCO
INGENIERÍA DE SISTEMAS
MEDELLÍN
2019

PRUEBA DE HABILIDADES TRABAJO FINAL CISCO

PRESENTADO POR

JULIANA ANDREA PALACIO DURANGO

GRUPO:

203092_28

TUTOR:

GERARDO GRANADOS ACUÑA

DIRECTOR:

JUAN CARLOS VESGA

UNIVERSIDAD NACIONAL Y A DISTANCIA - UNAD

DIPLOMADO DE PROFUNDIZACIÓN CISCO

INGENIERÍA DE SISTEMAS

MEDELLÍN

2019

AGRADECIMIENTOS

Principalmente quiero darle gracias a Dios, quien con su bendición llena siempre mi vida y a toda mi familia por estar siempre presentes.

Mi profundo agradecimiento a todos los tutores, directores y personal que hacen parte de la familia Unadista, por confiar en mí, por su apoyo incondicional, por su colaboración, dedicación y entrega, por abrirme las puertas y permitirme realizar todo este proceso académico lleno de paciencia, enseñanzas y mucho aprendizaje dentro de su establecimiento educativo.

De igual manera mis agradecimientos a la Escuela de Ciencias Básicas, Tecnología e Ingeniería, a cada uno de mis profesores quienes con la enseñanza de sus valiosos conocimientos que me transmitieron hicieron que pueda crecer día a día como una profesional.

Finalmente a mi familia, a mi abuela y a mis padres que siempre estuvieron presentes durante mi desarrollo académico.

Tabla de contenido

GLOSARIO

BROADCAST: método para enviar paquetes de datos a los dispositivos de red. Los broadcast se identifican por una dirección broadcast y utiliza routers para enviar que los mensajes de broadcast se envíen a otras redes.

CABLEADO: columna vertebral de una red la cual utiliza un medio físico de cable, casi siempre del tipo de red de área local (LAN), de forma que la información se transmite de un nodo a otro.

DHCP: siglas del inglés "Dynamic Host Configuration Protocol." Protocolo Dinámico deConfiguración del Host. Un servidor de red usa este protocolo para asignar de forma dinámica las direcciones IP a las diferentes computadoras de la red.

DNS: sistema de dominación de dominios. Sistema que proporciona una manera de asignar nombres de hots fáciles de recordar, o URL a direcciones IP.

INTERNET: una red mundial, de redes de computadoras. Es una interconexión de redes grandes y chicas alrededor del mundo.

IP: internet Protocol, Protocolo de Internet. Conjunto de reglas que regulan latransmisión de paquetes de datos a través de Internet.

IPV4: el Internet Protocol versión 4 (IPv4) (en español: Protocolo de Internet versión 4) es la cuarta versión del protocolo Internet Protocol (IP), y la primera en ser implementado a gran escala. Definida en el RFC 791.IPv4 usa direcciones de 32 bits, limitándose a = 4.294.967.296 direcciones únicas, muchas de las cuales están dedicadas a redes locales (LANs).

LAN: (Red de área local) Una red de área local, red local o LAN (del inglés local area network) es la inter conexión de una o varias computadoras y periféricos. Su extensión está limitada físicamente a un edificio o a un entorno

de 200 metros, con repetidores podría llegar a la distancia de un campo de 1 kilómetro.

MASCARA DE SUBRED: mascara de dirección de 32 bit que se usa en IP para indicar los bits de una dirección IP que están siendo utilizados para la dirección de subred. Segundo grupo de números de una dirección IP.

PING: herramienta para la resolución de problemas. Se usa para verificar la conectividad de la red mediante el envío de un paquete a una dirección IP específica y la espera de la respuesta.

RIP: protocolo de información de enrutamiento. IGP suministrado con los sistemas UNIX BSD. El IGP más común de Internet. El RIP usa el conteo de saltos como métrica de enrutamiento.

ROUTER: dirigen paquetes de una red a otra, desde el origen inicial hacia el destino final adecuado. Los routers conectan diferentes medios.

RUTA SUMARIZADA: la sumarización de ruta reduce el número de rutas que el router debe mantener. Es un método para representar una serie de números de red en una única dirección sumarizada.

TRAMA: agrupación lógica de información que se envía atreves de un medio d transmisión como unidad de capa de enlace de datos. A menudo se refiere al encabezado y a la información final que se usa para la sincronización y el control de errores que rodean a los datos del usuario contenidos en la unidad

VLSM: máscara de subred de longitud variable. Capacidad para especificar una máscara de subred distinta para el mismo número de red en distintas subredes. Las VLSM pueden ayudar a optimizar el espacio de dirección disponible.

RESUMEN

El diseño y la implementación de soluciones integradas basadas en el uso de tecnología CISCO hace que se tenga en cuenta todos los temas relacionados con las redes. De acuerdo a esto, el diplomado de DISEÑO E IMPLEMENTACIÓN DE SOLUCIONES INTEGRADAS LAN – WAN, con el apoyo de la plataforma CISCO y su forma de estudio, aprendimos acerca de de Introducción a las redes (Introduction to Networks) y Principios básicos de routing y switching para trabajar en diferentes casos de para demostrar todo el conocimiento adquirido y aplicado dentro del curso de CCNA1 y CCNA2.

Hoy en día, en los hogares y en las empresas, las telecomunicaciones y la favilidad de comunicación es de vital importancia y saber cómo utilizar y conectar el cableado apropiado y los dispositivos correspondientes hacen que se disponga de una red según sus necesidades y con este diplomado y la puesta en marcha lo podemos aplicar en la actualidad y aplicarlo en nuestra vida profesional. El desarrollo de las actividades propuestas se basa bajo protocolo de enrutamiento, manejo aplicación de la herramienta de Packet Tracer.

Palabras clave:

CISCO, Packet Tracer, Redes, LAN, CCNA.

ABSTRACT

The design and implementation of integrated solutions based on the use of CISCO technology means that all issues related to networks are taken into account. According to this, the LAN - WAN DESIGN AND IMPLEMENTATION OF INTEGRATED SOLUTIONS diploma, with the support of the CISCO platform and its study form, we learned about Introduction to Networks and Basic principles of routing and switching to work in different cases to demonstrate all the knowledge acquired and applied within the course of CCNA1 and CCNA2.

Nowadays, in homes and companies, telecommunications and communication fability is of vital importance and knowing how to use and connect the appropriate wiring and the corresponding devices make available a network according to your needs and with this diploma and the implementation can be applied today and apply it in our professional life. The development of the proposed activities is based on routing protocol, application management of the Packet Tracer tool.

Keywords:

CISCO, Packet Tracer, Networks, LAN, CCNA.

INTRODUCCIÓN

Durante el curso extensivo de CCNA1 Y CCNA2 y la apropiación de los módulos del diplomado de profundización de Cisco (CCNA), se apropiaron conceptos del mundo Networking donde se adquiere el afianzamiento académico requerido para entender las necesidades reales que pueda tener una empresa u hogar.

En el presente informe se pone en práctica el desarrollo de las habilidades por todo el conocimiento obtenido durante el curso, comprendiendo y aplicando los conceptos fundamentales en redes, tales como protocolos de enrutamiento RIP versión 2, OSPF, listas de control de acceso (ACL), DHCP, VLANs y Servicios NAT y PAT, Redireccionamiento, Seguridad, LAN, Autenticación PAP y CHAP, entre otros, con el fin de lograr el desarrollo de los dos escenarios propuestos a través de la herramienta de simulación de Cisco (Packet Tracer) que es fundamental para el desarrollo de las prácticas acompañados de los respectivos procesos de documentación correspondientes a cada uno de los dispositivos, la descripción detallada del paso a paso de cada una de las etapas de los escenarios y el registro de la verificación de conectividad mediante el uso de comandos ping, traceroute, show ip route, show ip protocol, entre otros.

Con esto buscamos identificar el grado de desarrollo de las competencias y habilidades, teniendo en cuenta que el diseño y la implementación de una topología de red debe cumplir con las características de una red bien diseñada, confiable, con buena velocidad, escalable y disponible.

1. CONTENIDO

1.1 ESCENARIO 1

Una empresa posee sucursales distribuidas en las ciudades de Bogotá y Medellín, en donde el estudiante será el administrador de la red, el cual deberá configurar e interconectar entre sí cada uno de los dispositivos que forman parte del escenario, acorde con los lineamientos establecidos para el direccionamiento IP, protocolos de enrutamiento y demás aspectos que forman parte de la topología de red.

Topología de red:

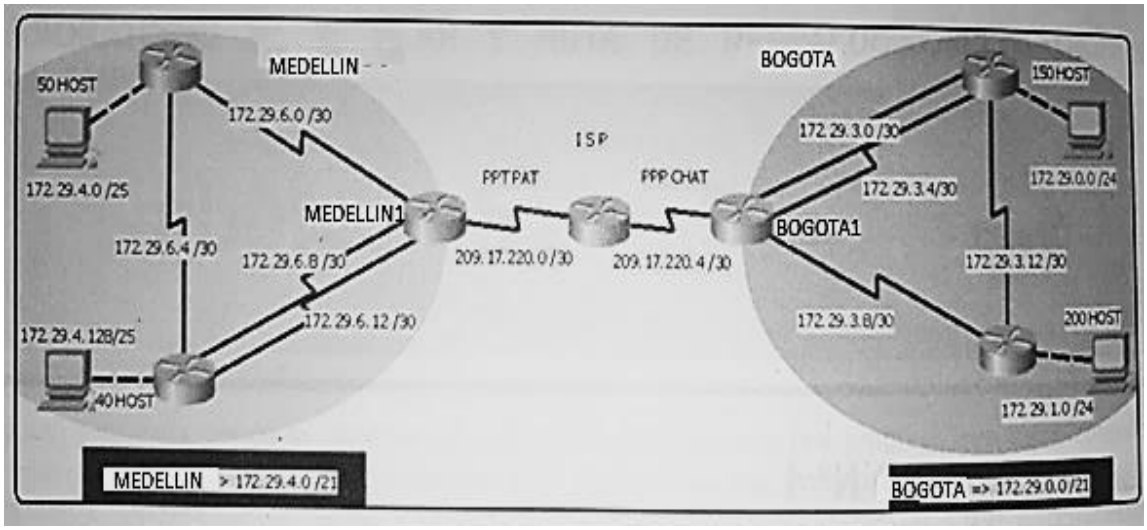


Figura 1 Topología propuesta escenario 1

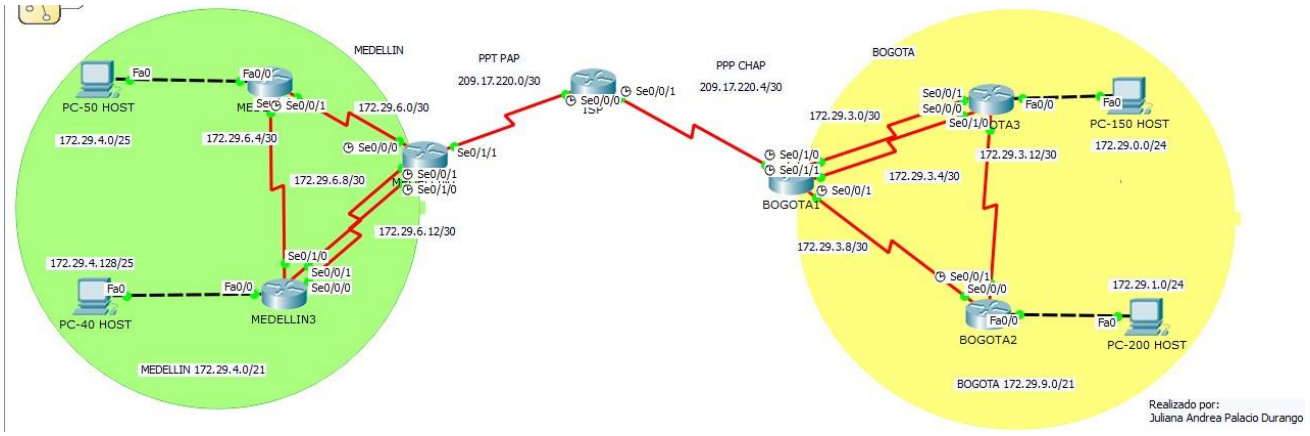


Figura 2 Topología desarrollada escenario 1

Este escenario plantea el uso de RIP como protocolo de enrutamiento, considerando que se tendran rutas por defecto redistribuidas; asimismo, habilitar el encapsulamiento PPP y su autenticación.

Los routers Bogota2 y medellin2 proporcionan el servicio DHCP a su propia red LAN y a los routers 3 de cada ciudad.

Debe configurar PPP en los enlaces hacia el ISP, con autenticación.

Debe habilitar NAT de sobrecarga en los routers Bogota1 y medellin1.

Tabla de direccionamiento propuesta:

EQUIPO	PUERTO	DIRECCIÓN IP	MASCARA	ENLACE	SEGURIDAD
ISP	S0/0/0	209.17.220.1	255.255.255.252	MEDELLIN1	PPT PAT
	S0/0/1	209.17.220.5	255.255.255.252	BOGOTA1	PPP CHAT
BOGOTA1	S0/0/0	209.17.220.6	255.255.255.252	ISP	
	S0/0/1	172.29.3.9	255.255.255.252	BOGOTA2	
	S0/1/0	172.29.3.5	255.255.255.252	BOGOTA3	1
	S0/1/1	172.29.3.1	255.255.255.252	BOGOTA3	2
BOGOTA2	S0/0/0	172.29.3.10	255.255.255.252	BOGOTA1	
	S0/0/1	172.29.3.13	255.255.255.252	BOGOTA3	
	F0/0	172.29.1.1	255.255.255.0	PC-200 HOST	
PC-200 HOST	F0/0	172.29.1.2	255.255.255.0		172.29.1.1
BOGOTA3	S0/0/0	172.29.3.2	255.255.255.252	BOGOTA1	2
	S0/0/1	172.29.3.6	255.255.255.252	BOGOTA1	1
	S0/1/0	172.29.3.14	255.255.255.252	BOGOTA2	
	F0/0	172.29.0.1	255.255.255.0	PC-150 HOST	
PC-150 HOST	F0/0	172.29.0.2	255.255.255.0		172.29.0.1
MEDELLIN1	S0/0/0	172.29.6.1	255.255.255.252	MEDELLIN2	
	S0/0/1	172.29.6.9	255.255.255.252	MEDELLIN3	1
	S0/1/0	172.29.6.13	255.255.255.252	MEDELLIN3	2
	S0/1/1	209.17.220.2	255.255.255.252	ISP	
MEDELLIN2	S0/0/0	172.29.6.2	255.255.255.252	MEDELLIN1	
	S0/0/1	172.29.6.5	255.255.255.252	MEDELLIN3	
	F0/0	172.29.4.1	255.255.255.128	PC-50 HOST	

PC-50 HOST	F0/0	172.29.4.2	255.255.255.128		172.29.4.1
MEDELLIN3	S0/0/0	172.29.6.14	255.255.255.252	MEDELLIN1	2
	S0/0/1	172.29.6.10	255.255.255.252	MEDELLIN1	1
	S0/1/0	172.29.6.6	255.255.255.252	MEDELLIN2	
	F0/0	172.29.4.129	255.255.255.128	PC-40 HOST	
PC-40 HOST	F0/0	172.29.4.130	255.255.255.128		172.29.4.128
LAN MEDELLIN		172.29.4.0	255.255.248.0		
LAN BOGOTA		172.29.9.0	255.255.248.0		

Tabla 1 Tabla de direccionamiento escenario 1

- **Configuramos el Hostname y le asiganos la IP a cada router y configuramos cada PC:**

*Para el desarrollo de cada uno de los pasos, entramos al modo privilegiado colocando el comando **enable**, y presionamos enter.*

*Ya en el modo privilegiado, el prompt cambia a el nombre del router con un **#,** y colocamos el comando **conFigura terminal**, para entrar al modo de configuración global.*

*Utilizamos el comando **hostname** + el nombre, ya que es una escritura de la etiqueta que se da a un dispositivo para darle un nombre y distinguirlo de los otros dispositivos y presionamos enter y automaticamente cambia el promt con el nombre que le dimos.*

*Una vez ubicados en el modo configuración global, colocamos el comando interface **int** seguido de la interfaz, en este caso el serial y presionamos enter.*

*Ahora estamos dentro de un sub modo de configuracion global, donde cambia el prompt a **(config-if)#** y le damos la ip y mascara la interfaz mediante el comando ip address [ip] [mascara de subred], presionamos enter.*

*Finalmente, activamos las interfaces ya que vienen desactivadas por defecto mediante comando **no shutdown**, y asi es como asignamos la ip a una interfaz de un router cisco.*

- **Router MEDELLIN1**

Router>enable
Router#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname MEDELLIN1
MEDELLIN1(config)#int s0/0/0
MEDELLIN1(config-if)#ip add 172.29.6.1 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MEDELLIN1(config-if)#int s0/0/1
MEDELLIN1(config-if)#ip add 172.29.6.9 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN1(config-if)#int s0/1/0
MEDELLIN1(config-if)#ip add 172.29.6.13 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
MEDELLIN1(config-if)#int s0/1/1

```
MEDELLIN1(config-if)#ip add 209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname MEDELLIN1
MEDELLIN1(config)#int s0/0/0
MEDELLIN1(config-if)#ip add 172.29.6.1 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MEDELLIN1(config-if)#int s0/0/1
MEDELLIN1(config-if)#ip add 172.29.6.9 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN1(config-if)#int s0/1/0
MEDELLIN1(config-if)#ip add 172.29.6.13 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
MEDELLIN1(config-if)#int s0/1/1
MEDELLIN1(config-if)#ip add 209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

Figura 3 Configuración router MEDELLIN1

- **Router MEDELLIN2:**

Router#enable

Router#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname MEDELLIN2

MEDELLIN2(config)#int s0/0/0

```
MEDELLIN2(config-if)#ip add 172.29.6.2 255.255.255.252
MEDELLIN2(config-if)#no shutdown
MEDELLIN2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
MEDELLIN2(config-if)#int s0/0/1
MEDELLIN2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed
state to up
MEDELLIN2(config-if)#int s0/0/1
MEDELLIN2(config-if)#ip add 172.29.6.5 255.255.255.252
MEDELLIN2(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN2(config-if)#int f0/0
MEDELLIN2(config-if)#ip add 172.29.4.1 255.255.255.128
MEDELLIN2(config-if)#no shutdown
MEDELLIN2(config-if)#exit
MEDELLIN2(config)#exit
MEDELLIN2#
%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN2#
```

```
Router#enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname MEDELLIN2
MEDELLIN2(config)#int s0/0/0
MEDELLIN2(config-if)#ip add 172.29.6.2 255.255.255.252
MEDELLIN2(config-if)#no shutdown

MEDELLIN2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

MEDELLIN2(config-if)#int s0/0/1
MEDELLIN2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

MEDELLIN2(config-if)#int s0/0/1
MEDELLIN2(config-if)#ip add 172.29.6.5 255.255.255.252
MEDELLIN2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MEDELLIN2(config-if)#int f0/0
MEDELLIN2(config-if)#ip add 172.29.4.1 255.255.255.128
MEDELLIN2(config-if)#no shutdown
MEDELLIN2(config-if)#exit
MEDELLIN2(config)#exit
MEDELLIN2#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN2#
```

Figura 4 Configuración router MEDELLIN2

- **Router MEDELLIN3:**

Router>enable

Router#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname MEDELLIN3

MEDELLIN3(config)#int s0/0/0

MEDELLIN3(config-if)#ip add 172.29.6.14 255.255.255.252

MEDELLIN3(config-if)#no shutdown

MEDELLIN3(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

```
MEDELLIN3(config-if)#int s0/0/1
MEDELLIN3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
MEDELLIN3(config-if)#ip add 172.29.6.10 255.255.255.252
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
MEDELLIN3(config-if)#int s0/1/0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up
MEDELLIN3(config-if)#int s0/1/0
MEDELLIN3(config-if)#ip add 172.29.6.6 255.255.255.252
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
MEDELLIN3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
MEDELLIN3(config-if)#int f0/0
MEDELLIN3(config-if)#ip add 172.29.4.129 255.255.255.128
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#exit
MEDELLIN3#
%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN3#
```

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname MEDELLIN3
MEDELLIN3(config)#int s0/0/0
MEDELLIN3(config-if)#ip add 172.29.6.14 255.255.255.252
MEDELLIN3(config-if)#no shutdown

MEDELLIN3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

MEDELLIN3(config-if)#int s0/0/1
MEDELLIN3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

MEDELLIN3(config-if)#ip add 172.29.6.10 255.255.255.252
MEDELLIN3(config-if)#no shutdown

MEDELLIN3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

MEDELLIN3(config-if)#int s0/1/0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

MEDELLIN3(config-if)#int s0/1/0
MEDELLIN3(config-if)#ip add 172.29.6.6 255.255.255.252
MEDELLIN3(config-if)#no shutdown

MEDELLIN3(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

MEDELLIN3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

MEDELLIN3(config-if)#int f0/0
MEDELLIN3(config-if)#ip add 172.29.4.129 255.255.255.128
MEDELLIN3(config-if)#no shutdown
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#exit
MEDELLIN3#
```

Figura 5 Configuración router MEDELLIN3

- **Router BOGOTA1:**

Router>enable

Router#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname BOGOTA1

BOGOTA1(config)#int s0/0/0

```
BOGOTA1(config-if)#ip add 209.17.220.6 255.255.255.252
BOGOTA1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
BOGOTA1(config-if)#int s0/0/1
BOGOTA1(config-if)#ip add 172.29.3.9 255.255.255.252
BOGOTA1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BOGOTA1(config-if)#int s0/1/0
BOGOTA1(config-if)#ip add 172.29.3.5 255.255.255.252
BOGOTA1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
BOGOTA1(config-if)#int s0/1/1
BOGOTA1(config-if)#ip add 172.29.3.1 255.255.255.252
BOGOTA1(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
BOGOTA1(config-if)#EXIT
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#
```

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname BOGOTA1
BOGOTA1(config)#int s0/0/0
BOGOTA1(config-if)#ip add 209.17.220.6 255.255.255.252
BOGOTA1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
BOGOTA1(config-if)#int s0/0/1
BOGOTA1(config-if)#ip add 172.29.3.9 255.255.255.252
BOGOTA1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BOGOTA1(config-if)#int s0/1/0
BOGOTA1(config-if)#ip add 172.29.3.5 255.255.255.252
BOGOTA1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
BOGOTA1(config-if)#int s0/1/1
BOGOTA1(config-if)#ip add 172.29.3.1 255.255.255.252
BOGOTA1(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/1, changed state to down
BOGOTA1(config-if)#EXIT
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#
```

Figura 6 Configuración router BOGOTA1

- **Router BOGOTA2:**

Router>enable

Router#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname BOGOTA2

BOGOTA2(config)#int s0/0/0

BOGOTA2(config-if)#ip add 172.29.3.10 255.255.255.252

BOGOTA2(config-if)#no shutdown

BOGOTA2(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

BOGOTA2(config-if)#int s0/0/1

BOGOTA2(config-if)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

BOGOTA2(config-if)#ip add 172.29.3.13 255.255.255.252

BOGOTA2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down

BOGOTA2(config-if)#int f0/0

BOGOTA2(config-if)#ip add 172.29.1.1 255.255.255.0

BOGOTA2(config-if)#no shutdown

BOGOTA2(config-if)#exit

BOGOTA2(config)#exit

BOGOTA2#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA2#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA2#

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname BOGOTA2
BOGOTA2(config)#int s0/0/0
BOGOTA2(config-if)#ip add 172.29.3.10 255.255.255.252
BOGOTA2(config-if)#no shutdown

BOGOTA2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

BOGOTA2(config-if)#int s0/0/1
BOGOTA2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

BOGOTA2(config-if)#ip add 172.29.3.13 255.255.255.252
BOGOTA2(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BOGOTA2(config-if)#int f0/0
BOGOTA2(config-if)#ip add 172.29.1.1 255.255.255.0
BOGOTA2(config-if)#no shutdown
BOGOTA2(config-if)#exit
BOGOTA2(config)#exit
BOGOTA2#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA2#
```

Figura 7 Configuración router BOGOTA2

- **Router BOGOTA3:**

Router>enable

Router#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#hostname BOGOTA3

BOGOTA3(config)#int s0/0/0

BOGOTA3(config-if)#ip add 172.29.3.2 255.255.255.252

BOGOTA3(config-if)#no shutdown

BOGOTA3(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

BOGOTA3(config-if)#int s0/0/1

```
BOGOTA3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed
state to up
BOGOTA3(config-if)#ip add 172.29.3.6 255.255.255.252
BOGOTA3(config-if)#no shutdown

BOGOTA3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
BOGOTA3(config-if)#int s0/1/0
BOGOTA3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed
state to up
BOGOTA3(config-if)#ip add 172.29.3.14 255.255.255.252
BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
BOGOTA3(config-if)#int f0/0
BOGOTA3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed
state to up
BOGOTA3(config-if)#ip add 172.29.0.1 255.255.255.0
BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#exit
BOGOTA3(config)#exit
BOGOTA3#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA3#
```

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname BOGOTA3
BOGOTA3(config)#int s0/0/0
BOGOTA3(config-if)#ip add 172.29.3.2 255.255.255.252
BOGOTA3(config-if)#no shutdown

BOGOTA3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

BOGOTA3(config-if)#int s0/0/1
BOGOTA3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

BOGOTA3(config-if)#ip add 172.29.3.6 255.255.255.252
BOGOTA3(config-if)#no shutdown

BOGOTA3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

BOGOTA3(config-if)#int s0/1/0
BOGOTA3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

BOGOTA3(config-if)#ip add 172.29.3.14 255.255.255.252
BOGOTA3(config-if)#no shutdown

BOGOTA3(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

BOGOTA3(config-if)#int f0/0
BOGOTA3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

BOGOTA3(config-if)#ip add 172.29.0.1 255.255.255.0
BOGOTA3(config-if)#no shutdown
BOGOTA3(config-if)#exit
BOGOTA3(config)#exit
BOGOTA3#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA3#
```

Figura 8 Configuración router BOGOTA3

- **Router ISP:**

```
Router#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname ISP
ISP(config)#int s0/0/0
ISP(config-if)#ip add 209.17.220.1 255.255.255.252
ISP(config-if)#no shutdown

ISP(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
ISP(config-if)#int s0/0/1
ISP(config-if)#ip add 209.17.220.5 255.255.255.252
ISP(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
ISP(config-if)#no shutdown
ISP(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
ISP(config-if)#exit
ISP(config)#exit
ISP#
%SYS-5-CONFIG_I: ConFigurad from console by console
ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up
```

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname ISP
ISP(config)#int s0/0/0
ISP(config-if)#ip add 209.17.220.1 255.255.255.252
ISP(config-if)#no shutdown

ISP(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

ISP(config-if)#int s0/0/1
ISP(config-if)#ip add 209.17.220.5 255.255.255.252
ISP(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

ISP(config-if)#no shutdown

ISP(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

ISP(config-if)#exit
ISP(config)#exit
ISP#
%SYS-5-CONFIG_I: Configured from console by console

ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Figura 9 Configuración router ISP

- Configuramos el clock rate para que se sincronice la conexión, si no, no va a ver entendimiento de la velocidad de los datos:

El clock rate, se usa para el sincronismo de la conexión. Sin el clockrate, la conexión no funciona porque no hay ningún entendimiento de la velocidad de los datos enviados entre los dispositivos. En este caso asignamos una velicidad de 128000 bits por segundo.

- **Router MEDELLIN1:**

MEDELLIN1>enable
MEDELLIN1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.

```
MEDELLIN1(config)#interface S0/0/0
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#write
Building configuration...
[OK]
MEDELLIN1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN1(config)#interface S0/0/1
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#interface S0/1/0
MEDELLIN1(config-if)#clock rate 128000
MEDELLIN1(config-if)#interface S0/1/1
MEDELLIN1(config-if)#clock rate 128000
This command applies only to DCE interfaces
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#write
Building configuration...
[OK]
MEDELLIN1#
```

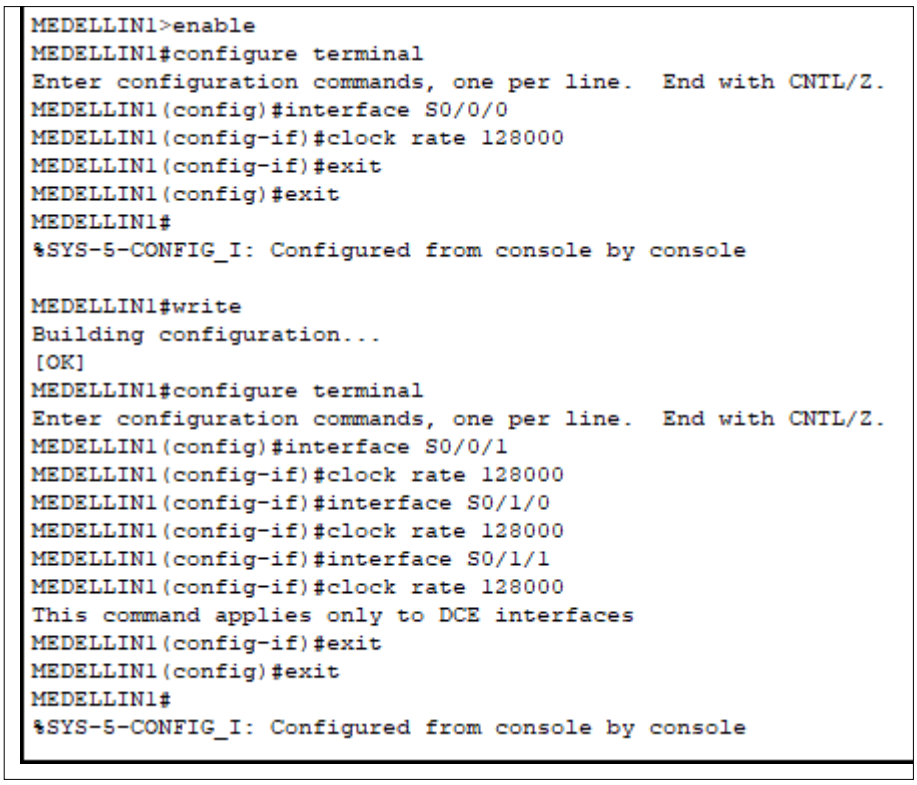


Figura 10 Configuración clock rate router MEDELLIN1

- **Router MEDELLIN2:**

MEDELLIN2>enable

MEDELLIN2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN2(config)#interface S0/0/0

MEDELLIN2(config-if)#clock rate 128000

This command applies only to DCE interfaces

MEDELLIN2(config-if)#interface S0/0/1

MEDELLIN2(config-if)#clock rate 128000

MEDELLIN2(config-if)#exit

MEDELLIN2(config)#exit

MEDELLIN2#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN2#write

Building configuration...

[OK]

MEDELLIN2#

```
MEDELLIN2>enable
MEDELLIN2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN2(config)#interface S0/0/0
MEDELLIN2(config-if)#clock rate 128000
This command applies only to DCE interfaces
MEDELLIN2(config-if)#interface S0/0/1
MEDELLIN2(config-if)#clock rate 128000
MEDELLIN2(config-if)#exit
MEDELLIN2(config)#exit
MEDELLIN2#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN2#write
Building configuration...
[OK]
MEDELLIN2#
```

Figura 11 Configuración clock rate router MEDELLIN2

- **Router MEDELLIN3:**

MEDELLIN3>enable

MEDELLIN3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN3(config)#interface S0/0/0

MEDELLIN3(config-if)#clock rate 128000

This command applies only to DCE interfaces

MEDELLIN3(config-if)#interface S0/0/1

MEDELLIN3(config-if)#clock rate 128000

This command applies only to DCE interfaces

MEDELLIN3(config-if)#exit

MEDELLIN3(config)#exit

MEDELLIN3#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN3#write

Building configuration...

[OK]

MEDELLIN3#

```
MEDELLIN3>enable
MEDELLIN3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN3(config)#interface S0/0/0
MEDELLIN3(config-if)#clock rate 128000
This command applies only to DCE interfaces
MEDELLIN3(config-if)#interface S0/0/1
MEDELLIN3(config-if)#clock rate 128000
This command applies only to DCE interfaces
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#exit
MEDELLIN3#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN3#write
Building configuration...
[OK]
MEDELLIN3#
```

Figura 12 Configuración clock rate router MEDELLIN3

- **Router BOGOTA1:**

BOGOTA1>enable

BOGOTA1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA1(config)#interface S0/0/0

BOGOTA1(config-if)#clock rate 128000

This command applies only to DCE interfaces

BOGOTA1(config-if)#interface S0/0/1

BOGOTA1(config-if)#clock rate 128000

BOGOTA1(config-if)#interface S0/1/0

BOGOTA1(config-if)#clock rate 128000

BOGOTA1(config-if)#interface S0/1/1

BOGOTA1(config-if)#clock rate 128000

BOGOTA1(config-if)#exit

BOGOTA1(config)#exit

BOGOTA1#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#wirte

Translating "wirte"...domain server (255.255.255.255)

% Unknown command or computer name, or unable to find computer address

BOGOTA1#write

Building configuration...

[OK]

BOGOTA1#

```
BOGOTA1>enable
BOGOTA1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA1(config)#interface S0/0/0
BOGOTA1(config-if)#clock rate 128000
This command applies only to DCE interfaces
BOGOTA1(config-if)#interface S0/0/1
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#interface S0/1/0
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#interface S0/1/1
BOGOTA1(config-if)#clock rate 128000
BOGOTA1(config-if)#exit
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA1#wirte
Translating "wirte"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

BOGOTA1#write
Building configuration...
[OK]
BOGOTA1#
```

Figura 13 Configuración clock rate router BOGOTA1

- **Router BOGOTA2:**

```
BOGOTA2>enable
BOGOTA2#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA2(config)#interface S0/0/0
BOGOTA2(config-if)#clock rate 128000
This command applies only to DCE interfaces
BOGOTA2(config-if)#interface S0/0/1
BOGOTA2(config-if)#clock rate 128000
BOGOTA2(config-if)#exit
BOGOTA2(config)#exit
BOGOTA2#
%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA2#write
Building configuration...
[OK]
BOGOTA2#
```

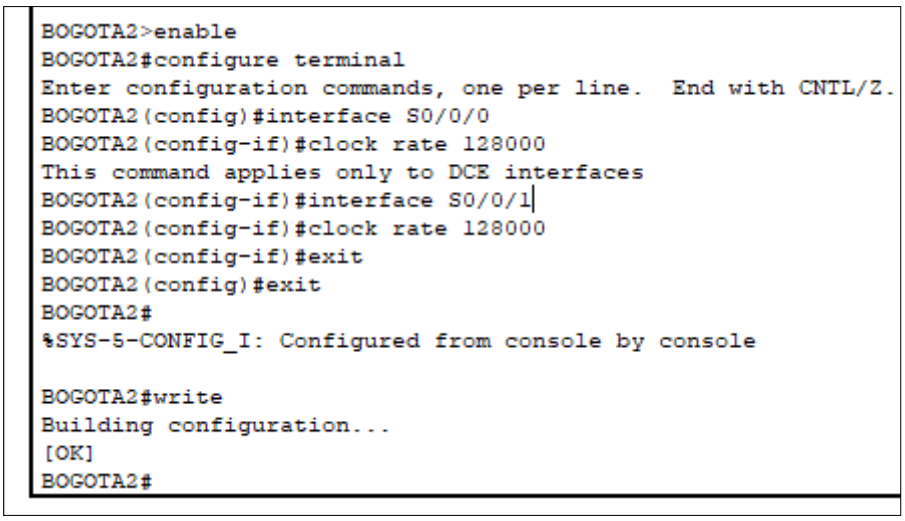


Figura 14 Configuración clock rate router BOGOTA2

- **Router BOGOTA3:**

BOGOTA3>enable

BOGOTA3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA3(config)#interface S0/0/0

BOGOTA3(config-if)#clock rate 128000

This command applies only to DCE interfaces

BOGOTA3(config-if)#interface S0/0/1

BOGOTA3(config-if)#clock rate 128000

This command applies only to DCE interfaces

BOGOTA3(config-if)#interface S0/1/0

BOGOTA3(config-if)#clock rate 128000

This command applies only to DCE interfaces

BOGOTA3(config-if)#exit

BOGOTA3(config)#exit

BOGOTA3#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA3#write

Building configuration...

[OK]

BOGOTA3#

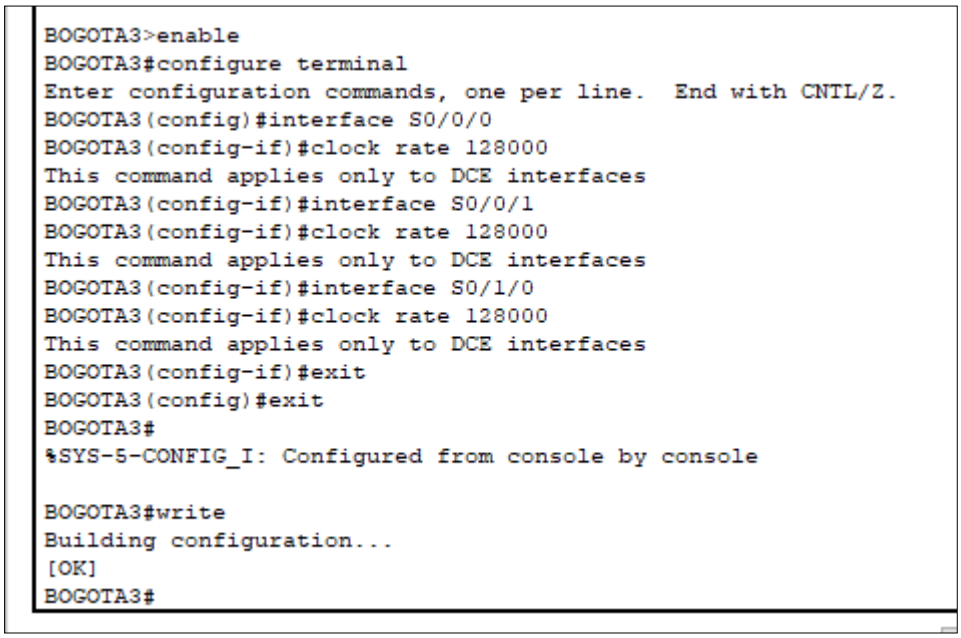


Figura 15 Configuración clock rate router BOGOTA3

- **Router ISP:**

ISP>enable

ISP#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

ISP(config)#interface S0/0/0

ISP(config-if)#clock rate 128000

ISP(config-if)#interface S0/0/1

ISP(config-if)#clock rate 128000

ISP(config-if)#exit

ISP(config)#exit

ISP#

%SYS-5-CONFIG_I: ConFigurad from console by console

ISP#write

Building configuration...

[OK]

ISP#

```
ISP>enable
ISP#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#interface S0/0/0
ISP(config-if)#clock rate 128000
ISP(config-if)#interface S0/0/1
ISP(config-if)#clock rate 128000
ISP(config-if)#exit
ISP(config)#exit
ISP#
%SYS-5-CONFIG_I: Configured from console by console

ISP#write
Building configuration...
[OK]
ISP#
```

Figura 16 Configuración clock rate router ISP

- **PC-HOST 50:**

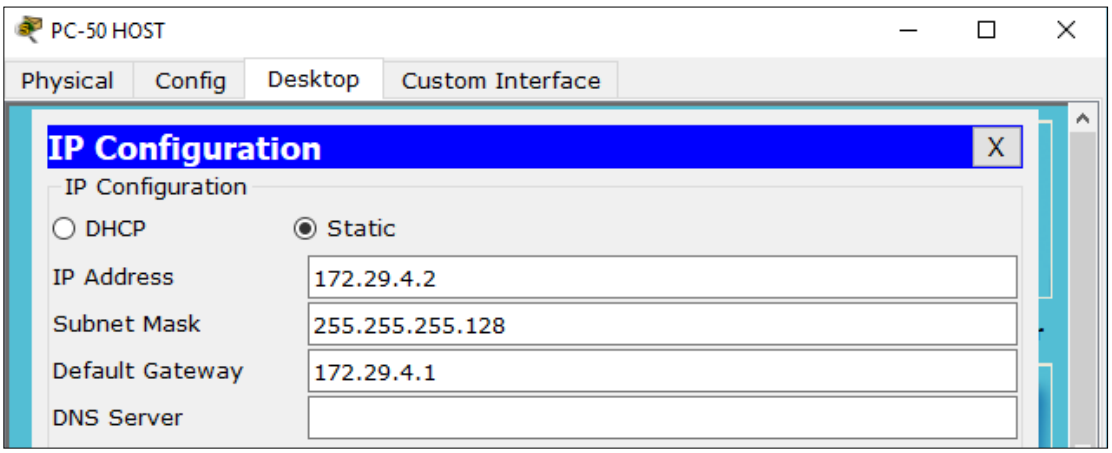


Figura 17 IP equipo host 50

- **PC-HOST 40:**

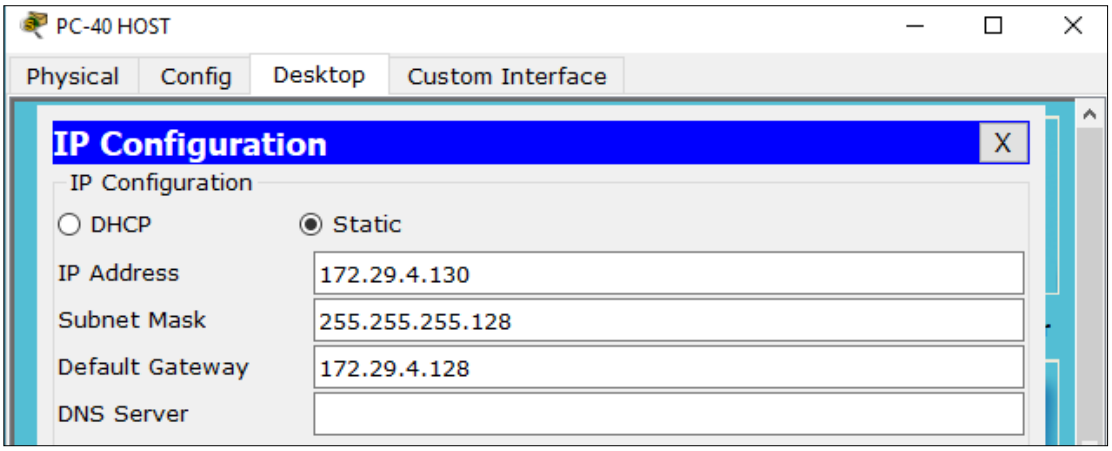


Figura 18 IP equipo host 40

- **PC-HOST 150:**

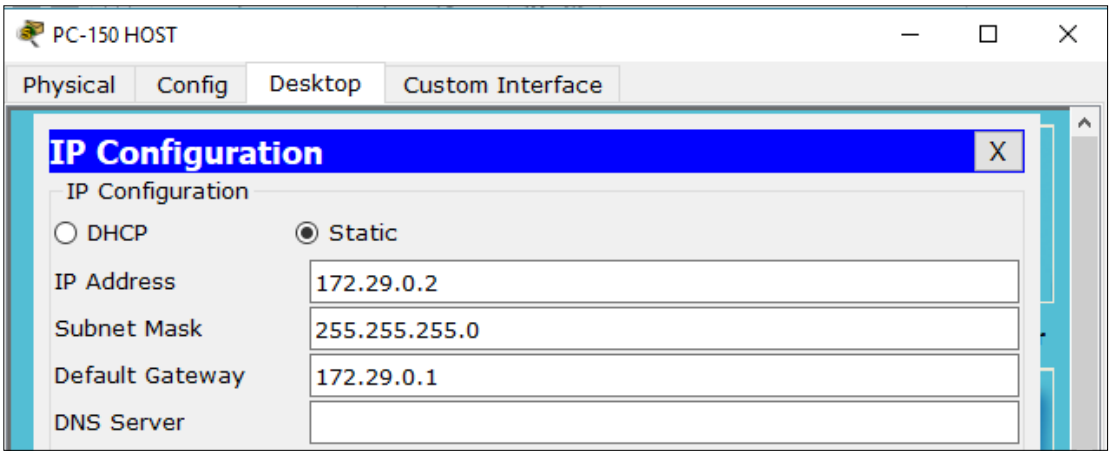


Figura 19 IP equipo host 150

- **PC-HOST 200:**

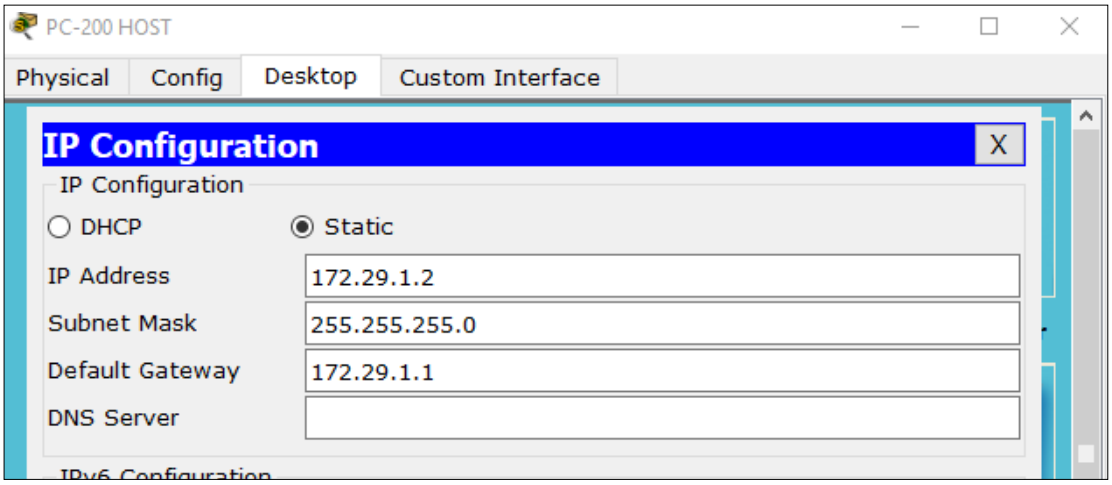


Figura 20 IP equipo host 200

- **Habilitamos los puertos de los router de MEDELLIN2, MEDELLIN3, BOGOTA3 y BOGOTA2:**

Habilitamos los puertos para permitir el reenvío de paquetes con los dispositivos.

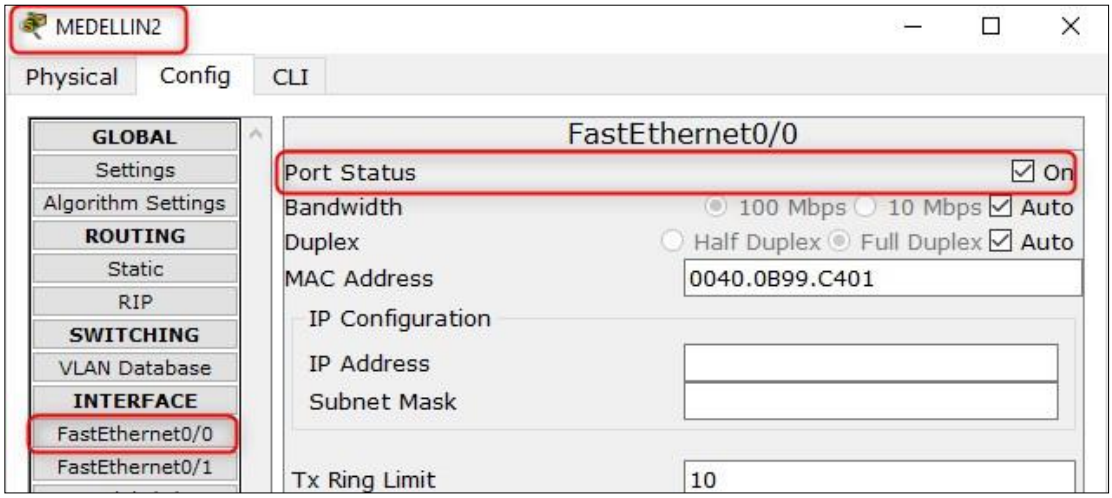


Figura 21 Habilitar puerto router MEDELLIN2

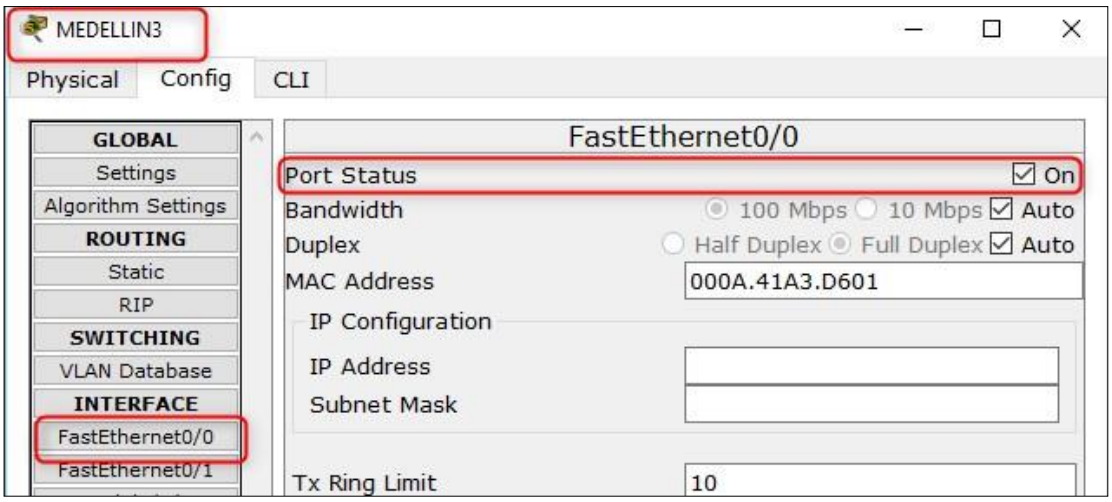


Figura 22 Habilitar puerto router MEDELLIN3

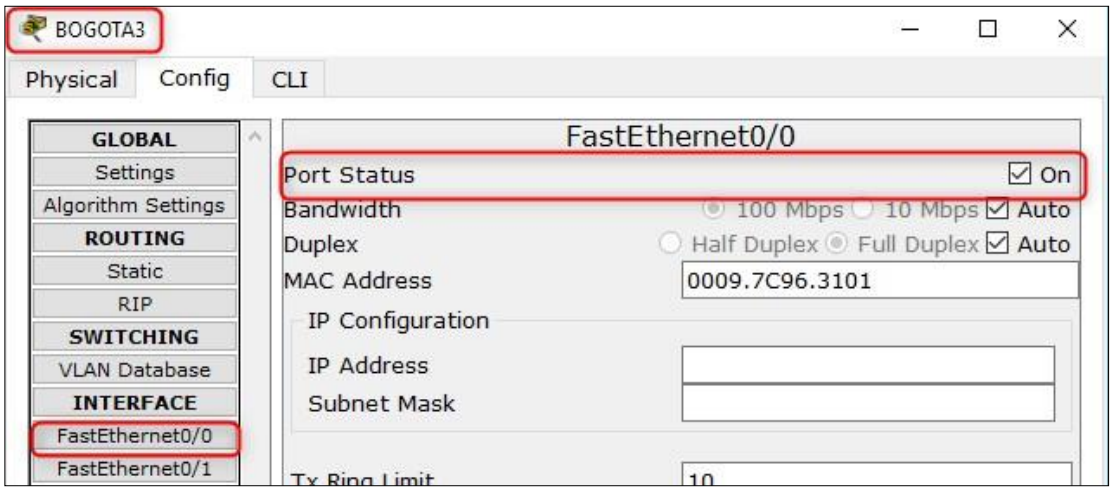


Figura 23 Habilitar puerto router BOGOTA3

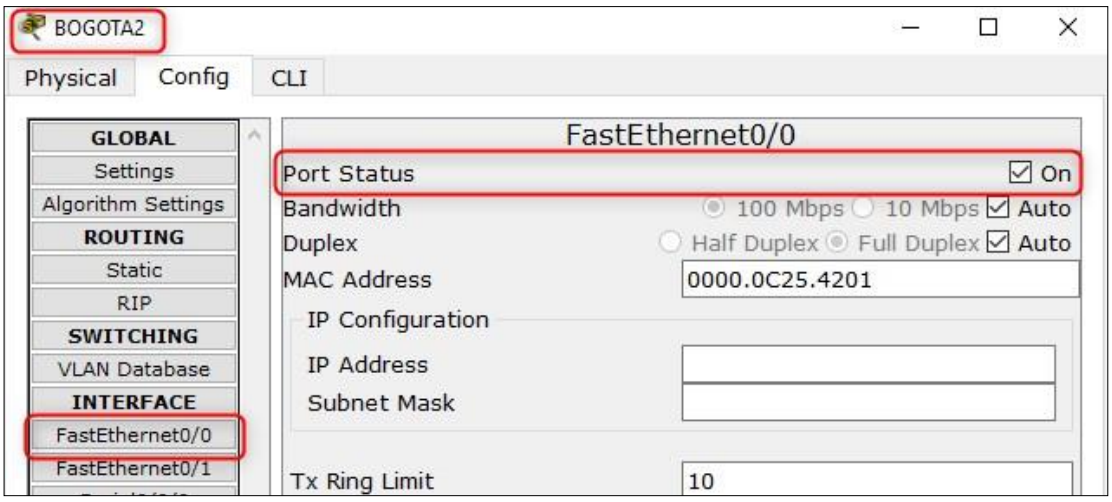


Figura 24 Habilitar puerto router BOGOTA2

1.1.1 Parte 1: Configuración del enrutamiento

a. Configurar el enrutamiento en la red usando el protocolo RIP versión 2, declare la red principal, desactive la sumarización automática.

- **Enrutamiento en la red usando el protocolo RIP versión 2:**

  Es uno de los protocolos de enrutamiento más sencillos y utilizados. Permite autenticación con clave encriptada, además RIP v2 admite el uso de enrutamiento sin clase en el cual diferentes subredes dentro de una misma red pueden utilizar distintas mascaras de subred.

  - **Router MEDELLIN1:**

MEDELLIN1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN1(config)#router rip
MEDELLIN1(config-router)#version 2

MEDELLIN1(config-router)#network 172.29.6.0

MEDELLIN1(config-router)#network 172.29.6.8

MEDELLIN1(config-router)#network 172.29.6.12

MEDELLIN1(config-router)#network 209.17.220.0

MEDELLIN1(config-router)#exit

MEDELLIN1(config)#exit

MEDELLIN1#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#

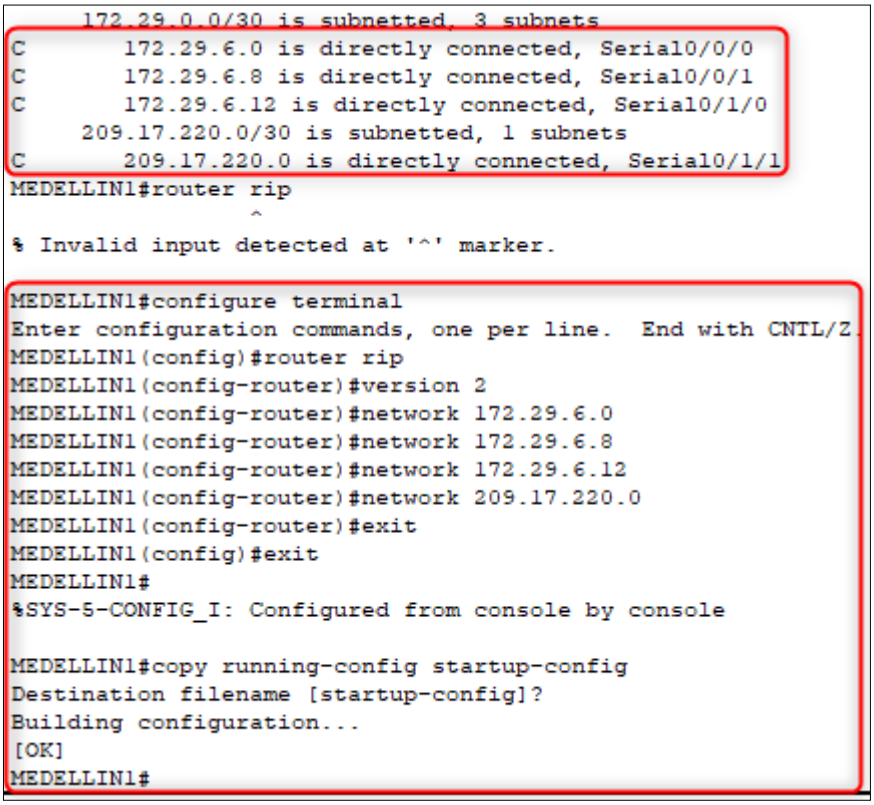


Figura 25 RIP versión 2 router MEDELLIN1

- **Router MEDELLIN2:**

```
MEDELLIN2#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN2(config)#router rip
MEDELLIN2(config-router)#version 2
MEDELLIN2(config-router)#network 172.29.4.0/25
^
% Invalid input detected at '^' marker.
MEDELLIN2(config-router)#172.29.4.0
^
% Invalid input detected at '^' marker.
MEDELLIN2(config-router)#network 172.29.4.0
MEDELLIN2(config-router)#network 172.29.6.0
MEDELLIN2(config-router)#network 172.29.6.4
MEDELLIN2(config-router)#exit
MEDELLIN2(config)#exit
MEDELLIN2#
%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN2#
```

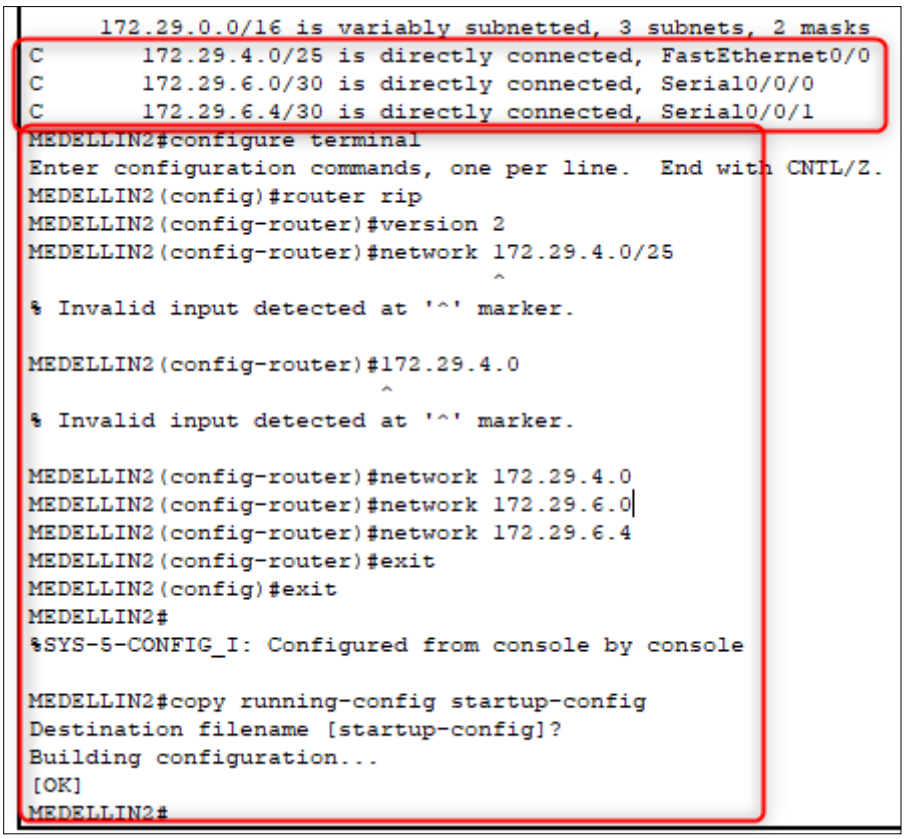


Figura 26 RIP versión 2 router MEDELLIN2

- **Router MEDELLIN3:**

MEDELLIN3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN3(config)#router rip

MEDELLIN3(config-router)#version 2

MEDELLIN3(config-router)#network 172.29.4.128

MEDELLIN3(config-router)#network 172.29.6.4

MEDELLIN3(config-router)#network 172.29.6.8

MEDELLIN3(config-router)#network 172.29.6.12

MEDELLIN3(config-router)#exit

MEDELLIN3(config)#exit

MEDELLIN3#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN3#

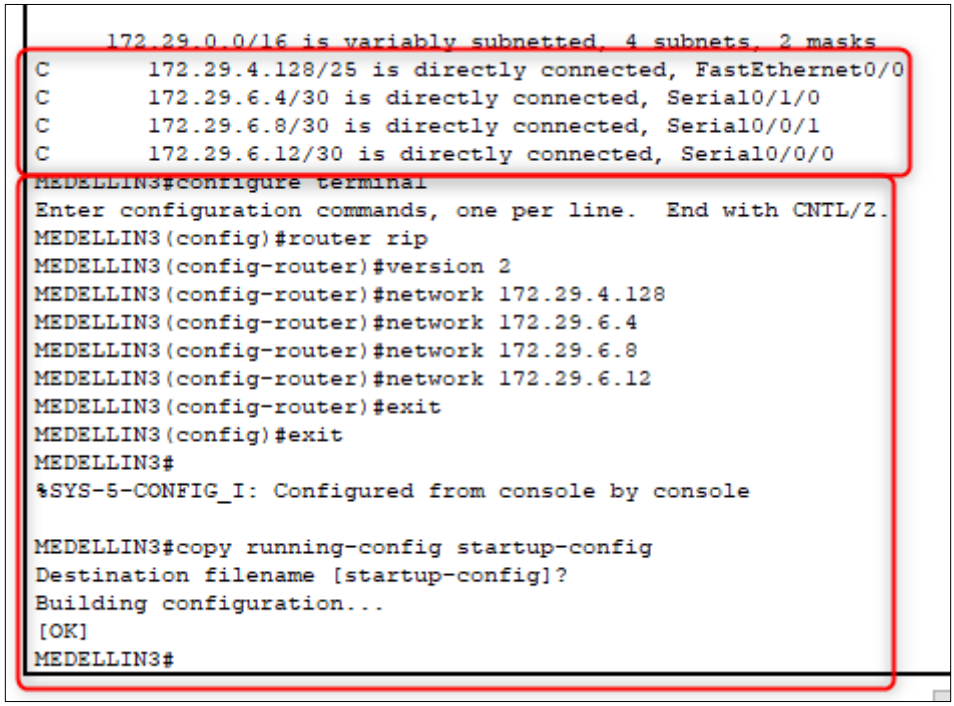


Figura 27 RIP versión 2 router MEDELLIN3

- **Router BOGOTA1:**

BOGOTA1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA1(config)#router rip

BOGOTA1(config-router)#version 2

BOGOTA1(config-router)#network 172.29.3.0

BOGOTA1(config-router)#network 172.29.3.4

BOGOTA1(config-router)#network 172.29.3.8

BOGOTA1(config-router)#network 209.17.220.4

BOGOTA1(config-router)#exit

BOGOTA1(config)#exit

BOGOTA1#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA1#

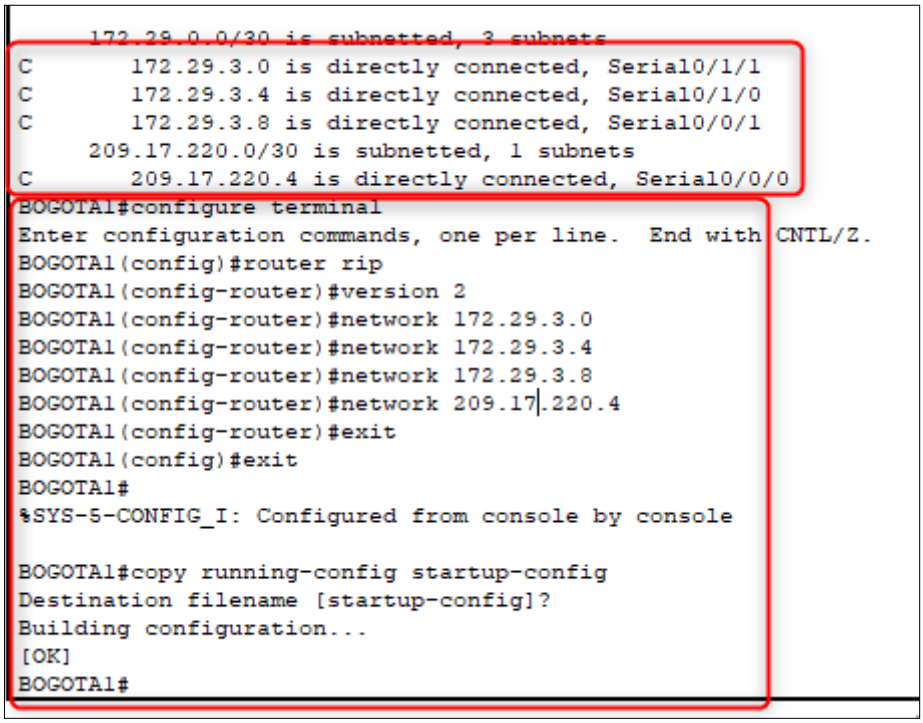


Figura 28 RIP versión 2 router BOGOTA1

- **Router BOGOTA2:**

BOGOTA2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA2(config)#router rip

BOGOTA2(config-router)#version 2

BOGOTA2(config-router)#network 172.29.1.0

BOGOTA2(config-router)#network 172.29.3.8

BOGOTA2(config-router)#network 172.29.3.12

BOGOTA2(config-router)#exit

BOGOTA2(config)#exit

BOGOTA2#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA2#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA2#

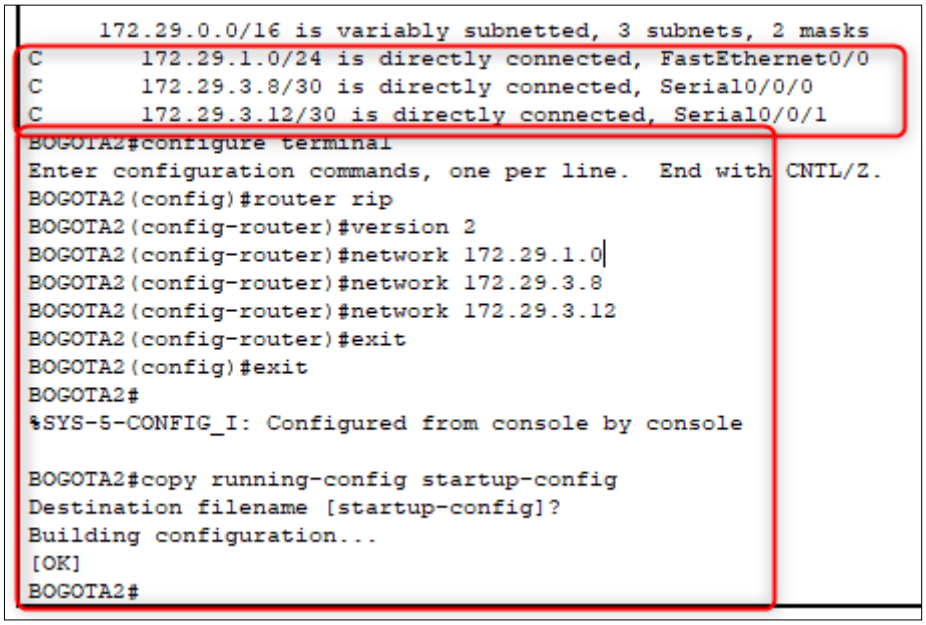


Figura 29 RIP versión 2 router BOGOTA2

- **Router BOGOTA3:**

BOGOTA3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA3(config)#router rip

BOGOTA3(config-router)#version 2

BOGOTA3(config-router)#network 172.29.0.0

BOGOTA3(config-router)#network 172.29.3.0

BOGOTA3(config-router)#network 172.29.3.4

BOGOTA3(config-router)#network 172.29.3.12

BOGOTA3(config-router)#exit

BOGOTA3(config)#exit

BOGOTA3#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA3#

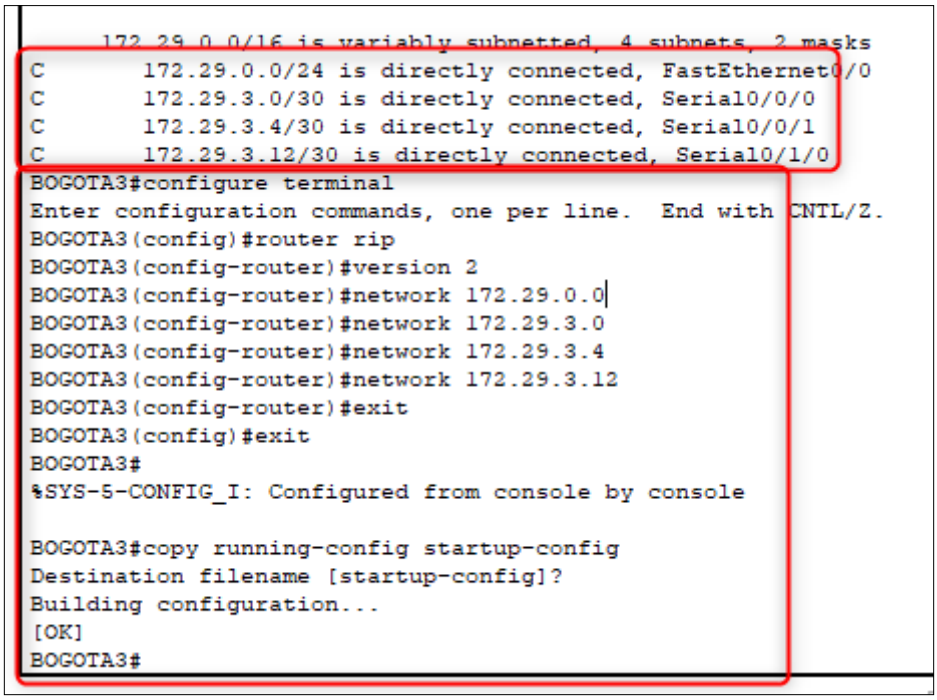


Figura 30 RIP versión 2 router BOGOTA3

- **Router ISP:**

ISP#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

ISP(config)#router rip

ISP(config-router)#version 2

ISP(config-router)#network 209.17.220.0

ISP(config-router)#network 209.17.220.4

ISP(config-router)#exit

ISP(config)#exit

ISP#

%SYS-5-CONFIG_I: ConFigurad from console by console

ISP#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

ISP#

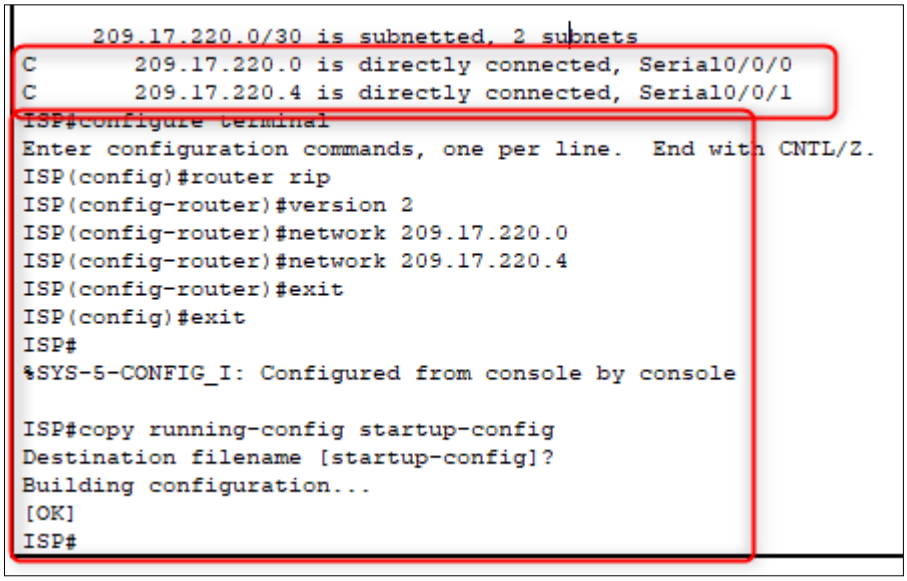


Figura 31 RIP versión 2 router ISP

- **Desactivamos la sumarización automática en cada router luego de haber configurado el protocolo RIP version 2:**

Los protocolos de enrutamiento dinámico por lo general realizan sumarización automática de sus rutas para optimizar las actualizaciones, pero esto puede ser deshabilitado en cualquier momento con el comando ***no auto-summary*** *dentro del modo de configuración del protocolo de enrutamiento, por lo tanto, lo realizamos para desactivar la sumarización automática en RIPv2.*

  - **Router MEDELLIN1:**

```
MEDELLIN1>enable
MEDELLIN1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN1(config)#router rip
MEDELLIN1(config-router)#no auto-summary
MEDELLIN1(config-router)#end
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

```
MEDELLIN1>enable
MEDELLIN1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN1(config)#router rip
MEDELLIN1(config-router)#no auto-summary
MEDELLIN1(config-router)#end
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

Figura 32 Desactivar sumarización router MEDELLIN1

- **Router MEDELLIN2:**

MEDELLIN2>enable

MEDELLIN2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN2(config)#router rip

MEDELLIN2(config-router)#no auto-summary

MEDELLIN2(config-router)#end

MEDELLIN2#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN2#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN2#

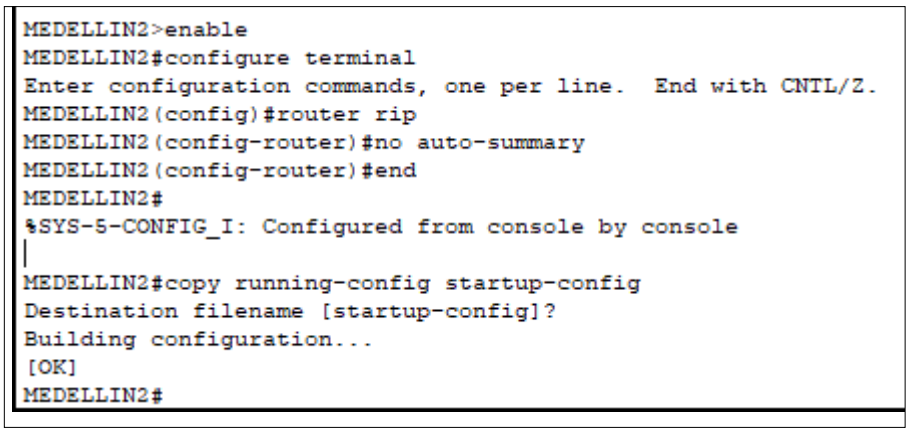


Figura 33 Desactivar sumarización router MEDELLIN2

- **Router MEDELLIN3:**

MEDELLIN3>enable

MEDELLIN3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN3(config)#router rip

MEDELLIN3(config-router)#no auto-summary

MEDELLIN3(config-router)#end

MEDELLIN3#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN3#

```
MEDELLIN3>enable
MEDELLIN3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN3(config)#router rip
MEDELLIN3(config-router)#no auto-summary
MEDELLIN3(config-router)#end
MEDELLIN3#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN3#
```

Figura 34 Desactivar sumarización router MEDELLIN3

- **Router BOGOTA1:**

BOGOTA1>enable

BOGOTA1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA1(config)#router rip

BOGOTA1(config-router)#no auto-summary

BOGOTA1(config-router)#end

BOGOTA1#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA1#

```
BOGOTA1>enable
BOGOTA1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA1(config)#router rip
BOGOTA1(config-router)#no auto-summary
BOGOTA1(config-router)#end
BOGOTA1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#
```

Figura 35 Desactivar sumarización router BOGOTA1

- **Router BOGOTA2:**

BOGOTA2>enable

BOGOTA2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA2(config)#router rip

BOGOTA2(config-router)#no auto-summary

BOGOTA2(config-router)#end

BOGOTA2#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA2#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA2#

```
BOGOTA2>enable
BOGOTA2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA2(config)#router rip
BOGOTA2(config-router)#no auto-summary
BOGOTA2(config-router)#end
BOGOTA2#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA2#
```

Figura 36 Desactivar sumarización router BOGOTA2

- **Router BOGOTA3:**

BOGOTA3>enable

BOGOTA3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA3(config)#router rip

BOGOTA3(config-router)#no auto-summary

BOGOTA3(config-router)#end

BOGOTA3#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA3#

```
BOGOTA3>enable
BOGOTA3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA3(config)#router rip
BOGOTA3(config-router)#no auto-summary
BOGOTA3(config-router)#end
BOGOTA3#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA3#
```

Figura 37 Desactivar sumarización router BOGOTA3

- **Router ISP:**

ISP>enable

ISP#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

ISP(config)#router rip

ISP(config-router)#no auto-summary

ISP(config-router)#end

ISP#

%SYS-5-CONFIG_I: ConFigurad from console by console

ISP#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

ISP#

```
ISP>enable
ISP#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#router rip
ISP(config-router)#no auto-summary
ISP(config-router)#end
ISP#
%SYS-5-CONFIG_I: Configured from console by console

ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#
```

Figura 38 Desactivar sumarización router ISP

b. Los routers Bogota1 y Medellín deberán añadir a su configuración de enrutamiento una ruta por defecto hacia el ISP y, a su vez, redistribuirla dentro de las publicaciones de RIP.

Para que dos dispositivos routers o switches intercambien información de enrutamiento, es preciso, que ambos dispositivos utilicen el mismo protocolo, en este caso RIP.

Al redistribuir en RIP el protocolo, este utiliza una métrica por defecto, con lo que es necesario especificar una métrica para que el router vecino incorpore la información de enrutamiento en su tabla.

- En los router MEDELLIN1 Y BOGOTA1 es necesario configurar una ruta por defecto hacia ISP:

    - **Configuramos una ruta estática de MEDELLIN1 a ISP:**

MEDELLIN1(config)#ip route 0.0.0.0 0.0.0.0 serial 0/1/1
MEDELLIN1(config)#exit
MEDELLIN1#

%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN1#

```
MEDELLIN1(config)#ip route 0.0.0.0 0.0.0.0 serial 0/1/1
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#
```

Figura 39 Ruta por defecto router MEDELLIN1 a router ISP

Tambien se puede realizar por medio de la IP con su salto, utilizando los siguientes comandos:

MEDELLIN1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.1
MEDELLIN1(config)#router rip
MEDELLIN1(config-router)#version 2
MEDELLIN1(config-router)#default-information originate

- **Configuramos una ruta estática de BOGOTA1 a ISP:**

BOGOTA1>enable
BOGOTA1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA1(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#

```
BOGOTA1>enable
BOGOTA1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA1(config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA1#
```

Figura 40 Ruta por defecto router BOGOTA1 a router ISP

Tambien se puede realizar por medio de la IP con su salto, utilizando los siguientes comandos:

BOGOTA1(config)#ip route 0.0.0.0 0.0.0.0 209.17.220.5
BOGOTA1(config)#router rip
BOGOTA1(config-router)#version 2
BOGOTA1(config-router)#default-information originate

- **Realizamos la redistribución:**

MEDELLIN1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN1(config)#route rip
MEDELLIN1(config-router)#version 2
MEDELLIN1(config-router)#redistribute rip metric 1
MEDELLIN1(config-router)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#

```
MEDELLIN1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN1(config)#route rip
MEDELLIN1(config-router)#version 2
MEDELLIN1(config-router)#redistribute rip metric 1
MEDELLIN1(config-router)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

Figura 41 Redistribución router MEDELLIN1

BOGOTA1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA1(config)#route rip

BOGOTA1(config-router)#version 2

BOGOTA1(config-router)#redistribute rip metric 1

BOGOTA1(config-router)#exit

BOGOTA1(config)#exit

BOGOTA1#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA1#

```
MEDELLIN1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN1(config)#route rip
MEDELLIN1(config-router)#version 2
MEDELLIN1(config-router)#redistribute rip metric 1
MEDELLIN1(config-router)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
MEDELLIN1#
```

Figura 42 Redistribución router BOGOTA1

c. El router ISP deberá tener una ruta estática dirigida hacia cada red interna de Bogotá y Medellín para el caso se sumarizan las subredes de cada uno a /22.

Cuando tenemos una red con varios routers, normalmente hay que ingresar varias rutas estáticas para tener acceso a las demás redes y con la sumarización es una forma mas fácil de llenar la tabla de enrutamiento

- **Sumarizamos y configuramos una ruta estática de ISP a BOGOTA1 y MEDELLIN1:**

ISP>enable
ISP#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
ISP(config)#ip route 172.29.4.0 255.255.252.0 s0/0/0
ISP(config)#ip route 172.29.0.0 255.255.252.0 s0/0/1
ISP(config)#exit
ISP#

%SYS-5-CONFIG_I: ConFigurad from console by console

ISP#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

ISP#

```
ISP>enable
ISP#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#ip route 172.29.4.0 255.255.252.0 s0/0/0
ISP(config)#ip route 172.29.0.0 255.255.252.0 s0/0/1
ISP(config)#exit
ISP#
%SYS-5-CONFIG_I: Configured from console by console

ISP#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
ISP#
```

Figura 43 Ruta estática router ISP

Para MEDELLIN tenemos las siguientes redes:

172.29.4.0/25

172.29.6.4/30

172.29.6.0/30

172.29.6.12/30

172.29.6.8/30

172.29.4.128/25

172.29.4.0/22

Para BOGOTA tenemos las siguientes redes:

172.29.3.0/30

172.29.3.8/30

172.29.3.4/30

172.29.3.12/30

172.29.0.0/24

172.29.1.0/24

172.29.0.0/22

Nota: También se puede realizar utilizando la IP con los siguientes comandos:

ISP(config)#ip route 172.29.4.0 255.255.252.0 209.17.220.2

ISP(config)#ip route 172.29.0.0 255.255.252.0 209.17.220.6

Realizamos PING desde el router de BOGOTA3 a BOGOTA1 para comprobar la conectividad:

BOGOTA3>enable

BOGOTA3#ping 172.29.3.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.29.3.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/17/36 ms

BOGOTA3#

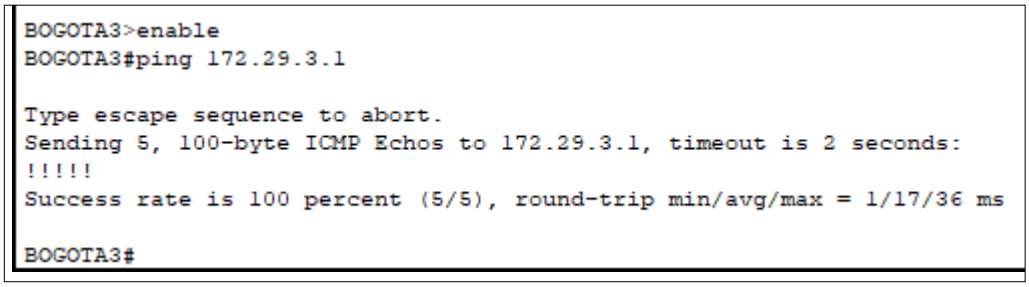


Figura 44 Ping de router BOGOTA3 a router BOGOTA1

1.1.2 Parte 2: Tabla de Enrutamiento.

a. Verificar la tabla de enrutamiento en cada uno de los routers para comprobar las redes y sus rutas.

- **Revisamos la tabla de enrutamiento de cada router utilizando el comando "show ip route":**

Imprime en pantalla el contenido de la tabla de enrutamiento. Todas las rutas a nivel de direccionamiento IP, ya sean estáticas o dinámicas se guardan en esta tabla.

- **MEDELLIN1:**

MEDELLIN1>enable
MEDELLIN1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

172.29.0.0 /16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:04, Serial0/1/1
R 172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:04, Serial0/1/1

R 172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:04, Serial0/1/1
R 172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:04, Serial0/1/1
R 172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:04, Serial0/1/1
R 172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:04, Serial0/1/1
R 172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:22, Serial0/0/0
R 172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:19, Serial0/1/0
[120/1] via 172.29.6.10, 00:00:19, Serial0/0/1
C 172.29.6.0/30 is directly connected, Serial0/0/0
R 172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:22, Serial0/0/0
[120/1] via 172.29.6.14, 00:00:19, Serial0/1/0
[120/1] via 172.29.6.10, 00:00:19, Serial0/0/1
C 172.29.6.8/30 is directly connected, Serial0/0/1
C 172.29.6.12/30 is directly connected, Serial0/1/0
209.17.220.0/30 is subnetted, 2 subnets
C 209.17.220.0 is directly connected, Serial0/1/1
R 209.17.220.4 [120/1] via 209.17.220.1, 00:00:04, Serial0/1/1
S* 0.0.0.0/0 is directly connected, Serial0/0/0
is directly connected, Serial0/1/1
MEDELLIN1#

```
MEDELLIN1>enable
MEDELLIN1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/3] via 209.17.220.1, 00:00:04, Serial0/1/1
R       172.29.1.0/24 [120/3] via 209.17.220.1, 00:00:04, Serial0/1/1
R       172.29.3.0/30 [120/2] via 209.17.220.1, 00:00:04, Serial0/1/1
R       172.29.3.4/30 [120/2] via 209.17.220.1, 00:00:04, Serial0/1/1
R       172.29.3.8/30 [120/2] via 209.17.220.1, 00:00:04, Serial0/1/1
R       172.29.3.12/30 [120/3] via 209.17.220.1, 00:00:04, Serial0/1/1
R       172.29.4.0/25 [120/1] via 172.29.6.2, 00:00:22, Serial0/0/0
R       172.29.4.128/25 [120/1] via 172.29.6.14, 00:00:19, Serial0/1/0
                        [120/1] via 172.29.6.10, 00:00:19, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
R       172.29.6.4/30 [120/1] via 172.29.6.2, 00:00:22, Serial0/0/0
                      [120/1] via 172.29.6.14, 00:00:19, Serial0/1/0
                      [120/1] via 172.29.6.10, 00:00:19, Serial0/0/1
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/1/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/1/1
R       209.17.220.4 [120/1] via 209.17.220.1, 00:00:04, Serial0/1/1
S*   0.0.0.0/0 is directly connected, Serial0/0/0
                is directly connected, Serial0/1/1
MEDELLIN1#
```

Figura 45 Show ip router MEDELLIN1

- **MEDELLIN2:**

MEDELLIN2>enable

MEDELLIN2#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 172.29.6.6 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:08, Serial0/0/0
R 172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:08, Serial0/0/0
R 172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:08, Serial0/0/0
R 172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:08, Serial0/0/0
R 172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:08, Serial0/0/0
R 172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:08, Serial0/0/0
C 172.29.4.0/25 is directly connected, FastEthernet0/0
R 172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
C 172.29.6.0/30 is directly connected, Serial0/0/0
C 172.29.6.4/30 is directly connected, Serial0/0/1
R 172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:08, Serial0/0/0
[120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
R 172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:08, Serial0/0/0
[120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
209.17.220.0 /30 is subnetted, 2 subnets
R 209.17.220.0 [120/1] via 172.29.6.1, 00:00:08, Serial0/0/0
R 209.17.220.4 [120/2] via 172.29.6.1, 00:00:08, Serial0/0/0
R* 0.0.0.0/0 [120/2] via 172.29.6.6, 00:00:10, Serial0/0/1
MEDELLIN2#

```
MEDELLIN2>enable
MEDELLIN2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.29.6.6 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.1, 00:00:08, Serial0/0/0
R       172.29.1.0/24 [120/4] via 172.29.6.1, 00:00:08, Serial0/0/0
R       172.29.3.0/30 [120/3] via 172.29.6.1, 00:00:08, Serial0/0/0
R       172.29.3.4/30 [120/3] via 172.29.6.1, 00:00:08, Serial0/0/0
R       172.29.3.8/30 [120/3] via 172.29.6.1, 00:00:08, Serial0/0/0
R       172.29.3.12/30 [120/4] via 172.29.6.1, 00:00:08, Serial0/0/0
C       172.29.4.0/25 is directly connected, FastEthernet0/0
R       172.29.4.128/25 [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
C       172.29.6.0/30 is directly connected, Serial0/0/0
C       172.29.6.4/30 is directly connected, Serial0/0/1
R       172.29.6.8/30 [120/1] via 172.29.6.1, 00:00:08, Serial0/0/0
                      [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
R       172.29.6.12/30 [120/1] via 172.29.6.1, 00:00:08, Serial0/0/0
                       [120/1] via 172.29.6.6, 00:00:10, Serial0/0/1
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.1, 00:00:08, Serial0/0/0
R       209.17.220.4 [120/2] via 172.29.6.1, 00:00:08, Serial0/0/0
R*   0.0.0.0/0 [120/2] via 172.29.6.6, 00:00:10, Serial0/0/1
```

Figura 46 Show ip router MEDELLIN2

- **MEDELLIN3:**

MEDELLIN3>enable

MEDELLIN3#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

172.29.0.0 /16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/4] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/4] via 172.29.6.13, 00:00:10, Serial0/0/0
R 172.29.1.0/24 [120/4] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/4] via 172.29.6.13, 00:00:10, Serial0/0/0
R 172.29.3.0/30 [120/3] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/3] via 172.29.6.13, 00:00:10, Serial0/0/0
R 172.29.3.4/30 [120/3] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/3] via 172.29.6.13, 00:00:10, Serial0/0/0
R 172.29.3.8/30 [120/3] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/3] via 172.29.6.13, 00:00:10, Serial0/0/0
R 172.29.3.12/30 [120/4] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/4] via 172.29.6.13, 00:00:10, Serial0/0/0
R 172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:15, Serial0/1/0
C 172.29.4.128/25 is directly connected, FastEthernet0/0
R 172.29.6.0/30 [120/1] via 172.29.6.13, 00:00:10, Serial0/0/0
[120/1] via 172.29.6.5, 00:00:15, Serial0/1/0
[120/1] via 172.29.6.9, 00:00:10, Serial0/0/1
C 172.29.6.4/30 is directly connected, Serial0/1/0
C 172.29.6.8/30 is directly connected, Serial0/0/1
C 172.29.6.12/30 is directly connected, Serial0/0/0
209.17.220.0/30 is subnetted, 2 subnets
R 209.17.220.0 [120/1] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/1] via 172.29.6.13, 00:00:10, Serial0/0/0
R 209.17.220.4 [120/2] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/2] via 172.29.6.13, 00:00:10, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:10, Serial0/0/1
[120/1] via 172.29.6.13, 00:00:10, Serial0/0/0
MEDELLIN3#

```
MEDELLIN3>enable
MEDELLIN3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/4] via 172.29.6.9, 00:00:10, Serial0/0/1
                      [120/4] via 172.29.6.13, 00:00:10, Serial0/0/0
R       172.29.1.0/24 [120/4] via 172.29.6.9, 00:00:10, Serial0/0/1
                      [120/4] via 172.29.6.13, 00:00:10, Serial0/0/0
R       172.29.3.0/30 [120/3] via 172.29.6.9, 00:00:10, Serial0/0/1
                      [120/3] via 172.29.6.13, 00:00:10, Serial0/0/0
R       172.29.3.4/30 [120/3] via 172.29.6.9, 00:00:10, Serial0/0/1
                      [120/3] via 172.29.6.13, 00:00:10, Serial0/0/0
R       172.29.3.8/30 [120/3] via 172.29.6.9, 00:00:10, Serial0/0/1
                      [120/3] via 172.29.6.13, 00:00:10, Serial0/0/0
R       172.29.3.12/30 [120/4] via 172.29.6.9, 00:00:10, Serial0/0/1
                       [120/4] via 172.29.6.13, 00:00:10, Serial0/0/0
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:15, Serial0/1/0
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.13, 00:00:10, Serial0/0/0
                      [120/1] via 172.29.6.5, 00:00:15, Serial0/1/0
                      [120/1] via 172.29.6.9, 00:00:10, Serial0/0/1
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 172.29.6.9, 00:00:10, Serial0/0/1
                     [120/1] via 172.29.6.13, 00:00:10, Serial0/0/0
R       209.17.220.4 [120/2] via 172.29.6.9, 00:00:10, Serial0/0/1
                     [120/2] via 172.29.6.13, 00:00:10, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:10, Serial0/0/1
               [120/1] via 172.29.6.13, 00:00:10, Serial0/0/0
MEDELLIN3#
```

Figura 47 Show ip router MEDELLIN3

- **BOGOTA1:**

BOGOTA1>enable

BOGOTA1#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

```
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/1] via 172.29.3.6, 00:00:07, Serial0/1/0
[120/1] via 172.29.3.2, 00:00:07, Serial0/1/1
R 172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:23, Serial0/0/1
C 172.29.3.0/30 is directly connected, Serial0/1/1
C 172.29.3.4/30 is directly connected, Serial0/1/0
C 172.29.3.8/30 is directly connected, Serial0/0/1
R 172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:23, Serial0/0/1
[120/1] via 172.29.3.6, 00:00:07, Serial0/1/0
[120/1] via 172.29.3.2, 00:00:07, Serial0/1/1
R 172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:07, Serial0/0/0
R 172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:07, Serial0/0/0
R 172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:07, Serial0/0/0
R 172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:07, Serial0/0/0
R 172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:07, Serial0/0/0
R 172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:07, Serial0/0/0
209.17.220.0   /30 is subnetted, 2 subnets
R 209.17.220.0 [120/1] via 209.17.220.5, 00:00:07, Serial0/0/0
C 209.17.220.4 is directly connected, Serial0/0/0
S* 0.0.0.0/0 is directly connected, Serial0/1/1
is directly connected, Serial0/0/0
BOGOTA1#
```

```
BOGOTA1>enable
BOGOTA1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.6, 00:00:07, Serial0/1/0
                      [120/1] via 172.29.3.2, 00:00:07, Serial0/1/1
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:23, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.10, 00:00:23, Serial0/0/1
                       [120/1] via 172.29.3.6, 00:00:07, Serial0/1/0
                       [120/1] via 172.29.3.2, 00:00:07, Serial0/1/1
R       172.29.4.0/25 [120/3] via 209.17.220.5, 00:00:07, Serial0/0/0
R       172.29.4.128/25 [120/3] via 209.17.220.5, 00:00:07, Serial0/0/0
R       172.29.6.0/30 [120/2] via 209.17.220.5, 00:00:07, Serial0/0/0
R       172.29.6.4/30 [120/3] via 209.17.220.5, 00:00:07, Serial0/0/0
R       172.29.6.8/30 [120/2] via 209.17.220.5, 00:00:07, Serial0/0/0
R       172.29.6.12/30 [120/2] via 209.17.220.5, 00:00:07, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/1] via 209.17.220.5, 00:00:07, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/0
S*   0.0.0.0/0 is directly connected, Serial0/1/1
                is directly connected, Serial0/0/0
BOGOTA1#
```

Figura 48 Show ip router BOGOTA1

- **BOGOTA2:**

BOGOTA2>enable

BOGOTA2#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 172.29.3.9 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R 172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:07, Serial0/0/1
C 172.29.1.0/24 is directly connected, FastEthernet0/0
R 172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
[120/1] via 172.29.3.14, 00:00:07, Serial0/0/1
R 172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
[120/1] via 172.29.3.14, 00:00:07, Serial0/0/1
C 172.29.3.8/30 is directly connected, Serial0/0/0
C 172.29.3.12/30 is directly connected, Serial0/0/1
R 172.29.4.0/25 [120/4] via 172.29.3.9, 00:00:16, Serial0/0/0
R 172.29.4.128/25 [120/4] via 172.29.3.9, 00:00:16, Serial0/0/0
R 172.29.6.0/30 [120/3] via 172.29.3.9, 00:00:16, Serial0/0/0
R 172.29.6.4/30 [120/4] via 172.29.3.9, 00:00:16, Serial0/0/0
R 172.29.6.8/30 [120/3] via 172.29.3.9, 00:00:16, Serial0/0/0
R 172.29.6.12/30 [120/3] via 172.29.3.9, 00:00:16, Serial0/0/0
209.17.220.0 /30 is subnetted, 2 subnets
R 209.17.220.0 [120/2] via 172.29.3.9, 00:00:16, Serial0/0/0
R 209.17.220.4 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
BOGOTA2#

```
BOGOTA2>enable
BOGOTA2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.29.3.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
R       172.29.0.0/24 [120/1] via 172.29.3.14, 00:00:07, Serial0/0/1
C       172.29.1.0/24 is directly connected, FastEthernet0/0
R       172.29.3.0/30 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:07, Serial0/0/1
R       172.29.3.4/30 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
                      [120/1] via 172.29.3.14, 00:00:07, Serial0/0/1
C       172.29.3.8/30 is directly connected, Serial0/0/0
C       172.29.3.12/30 is directly connected, Serial0/0/1
R       172.29.4.0/25 [120/4] via 172.29.3.9, 00:00:16, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.9, 00:00:16, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.9, 00:00:16, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.9, 00:00:16, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.9, 00:00:16, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.9, 00:00:16, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.9, 00:00:16, Serial0/0/0
R       209.17.220.4 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.3.9, 00:00:16, Serial0/0/0
BOGOTA2#
BOGOTA2#
```

Figura 49Show ip router BOGOTA2

- **BOGOTA3:**

BOGOTA3>enable

BOGOTA3#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 172.29.3.5 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
C 172.29.0.0/24 is directly connected, FastEthernet0/0
R 172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:00, Serial0/1/0
C 172.29.3.0/30 is directly connected, Serial0/0/0
C 172.29.3.4/30 is directly connected, Serial0/0/1
R 172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/1] via 172.29.3.1, 00:00:21, Serial0/0/0
[120/1] via 172.29.3.13, 00:00:00, Serial0/1/0
C 172.29.3.12/30 is directly connected, Serial0/1/0
R 172.29.4.0/25 [120/4] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/4] via 172.29.3.1, 00:00:21, Serial0/0/0
R 172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/4] via 172.29.3.1, 00:00:21, Serial0/0/0
R 172.29.6.0/30 [120/3] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/3] via 172.29.3.1, 00:00:21, Serial0/0/0
R 172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/4] via 172.29.3.1, 00:00:21, Serial0/0/0
R 172.29.6.8/30 [120/3] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/3] via 172.29.3.1, 00:00:21, Serial0/0/0
R 172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/3] via 172.29.3.1, 00:00:21, Serial0/0/0
209.17.220.0 /30 is subnetted, 2 subnets
R 209.17.220.0 [120/2] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/2] via 172.29.3.1, 00:00:21, Serial0/0/0
R 209.17.220.4 [120/1] via 172.29.3.5, 00:00:21, Serial0/0/1
[120/1] via 172.29.3.1, 00:00:21, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:21, Serial0/0/1
BOGOTA3#

```
BOGOTA3>enable
BOGOTA3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.29.3.5 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 12 subnets, 3 masks
C       172.29.0.0/24 is directly connected, FastEthernet0/0
R       172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:00, Serial0/1/0
C       172.29.3.0/30 is directly connected, Serial0/0/0
C       172.29.3.4/30 is directly connected, Serial0/0/1
R       172.29.3.8/30 [120/1] via 172.29.3.5, 00:00:21, Serial0/0/1
                      [120/1] via 172.29.3.1, 00:00:21, Serial0/0/0
                      [120/1] via 172.29.3.13, 00:00:00, Serial0/1/0
C       172.29.3.12/30 is directly connected, Serial0/1/0
R       172.29.4.0/25 [120/4] via 172.29.3.5, 00:00:21, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:21, Serial0/0/0
R       172.29.4.128/25 [120/4] via 172.29.3.5, 00:00:21, Serial0/0/1
                        [120/4] via 172.29.3.1, 00:00:21, Serial0/0/0
R       172.29.6.0/30 [120/3] via 172.29.3.5, 00:00:21, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:21, Serial0/0/0
R       172.29.6.4/30 [120/4] via 172.29.3.5, 00:00:21, Serial0/0/1
                      [120/4] via 172.29.3.1, 00:00:21, Serial0/0/0
R       172.29.6.8/30 [120/3] via 172.29.3.5, 00:00:21, Serial0/0/1
                      [120/3] via 172.29.3.1, 00:00:21, Serial0/0/0
R       172.29.6.12/30 [120/3] via 172.29.3.5, 00:00:21, Serial0/0/1
                       [120/3] via 172.29.3.1, 00:00:21, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
R       209.17.220.0 [120/2] via 172.29.3.5, 00:00:21, Serial0/0/1
                     [120/2] via 172.29.3.1, 00:00:21, Serial0/0/0
R       209.17.220.4 [120/1] via 172.29.3.5, 00:00:21, Serial0/0/1
                     [120/1] via 172.29.3.1, 00:00:21, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.3.5, 00:00:21, Serial0/0/1
BOGOTA3#
BOGOTA3#
```

Figura 50 Show ip router BOGOTA3

- **ISP**

ISP>enable

ISP#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 209.17.220.2 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 14 subnets, 4 masks
S 172.29.0.0/22 is directly connected, Serial0/0/1
R 172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:24, Serial0/0/1
R 172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:24, Serial0/0/1
R 172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
R 172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
R 172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
R 172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:24, Serial0/0/1
S 172.29.4.0/22 is directly connected, Serial0/0/0
R 172.29.4.0/25 [120/2] via 209.17.220.2, 00:00:20, Serial0/0/0
R 172.29.4.128/25 [120/2] via 209.17.220.2, 00:00:20, Serial0/0/0
R 172.29.6.0/30 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
R 172.29.6.4/30 [120/2] via 209.17.220.2, 00:00:20, Serial0/0/0
R 172.29.6.8/30 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
R 172.29.6.12/30 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
209.17.220.0/30 is subnetted, 2 subnets
C 209.17.220.0 is directly connected, Serial0/0/0
C 209.17.220.4 is directly connected, Serial0/0/1
R* 0.0.0.0/0 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
[120/1] via 209.17.220.6, 00:00:24, Serial0/0/1

```
ISP>enable
ISP#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 209.17.220.2 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 14 subnets, 4 masks
S       172.29.0.0/22 is directly connected, Serial0/0/1
R       172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:24, Serial0/0/1
R       172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:24, Serial0/0/1
R       172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
R       172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
R       172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
R       172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:24, Serial0/0/1
S       172.29.4.0/22 is directly connected, Serial0/0/0
R       172.29.4.0/25 [120/2] via 209.17.220.2, 00:00:20, Serial0/0/0
R       172.29.4.128/25 [120/2] via 209.17.220.2, 00:00:20, Serial0/0/0
R       172.29.6.0/30 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
R       172.29.6.4/30 [120/2] via 209.17.220.2, 00:00:20, Serial0/0/0
R       172.29.6.8/30 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
R       172.29.6.12/30 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
     209.17.220.0/30 is subnetted, 2 subnets
C       209.17.220.0 is directly connected, Serial0/0/0
C       209.17.220.4 is directly connected, Serial0/0/1
R*   0.0.0.0/0 [120/1] via 209.17.220.2, 00:00:20, Serial0/0/0
                [120/1] via 209.17.220.6, 00:00:24, Serial0/0/1
ISP#
ISP#
```

Figura 51 Show ip router ISP

b. Verificar el balanceo de carga que presentan los routers.

- Utilizamos el comando “show ip route”, “show ip protocols” y “debug ip packet” para ver el balanceo de carga en los router de MEDELLIN1, MEDELLIN3, BOGOTA1, BOGOTA3

  - **MEDELLIN1:**

MEDELLIN3#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

172.29.0.0 /16 is variably subnetted, 6 subnets, 2 masks

R 172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:09, Serial0/1/0

C 172.29.4.128/25 is directly connected, FastEthernet0/0

R 172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1

[120/1] via 172.29.6.5, 00:00:09, Serial0/1/0

C 172.29.6.4/30 is directly connected, Serial0/1/0

C 172.29.6.8/30 is directly connected, Serial0/0/1

C 172.29.6.12/30 is directly connected, Serial0/0/0

R* 0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1

MEDELLIN3#

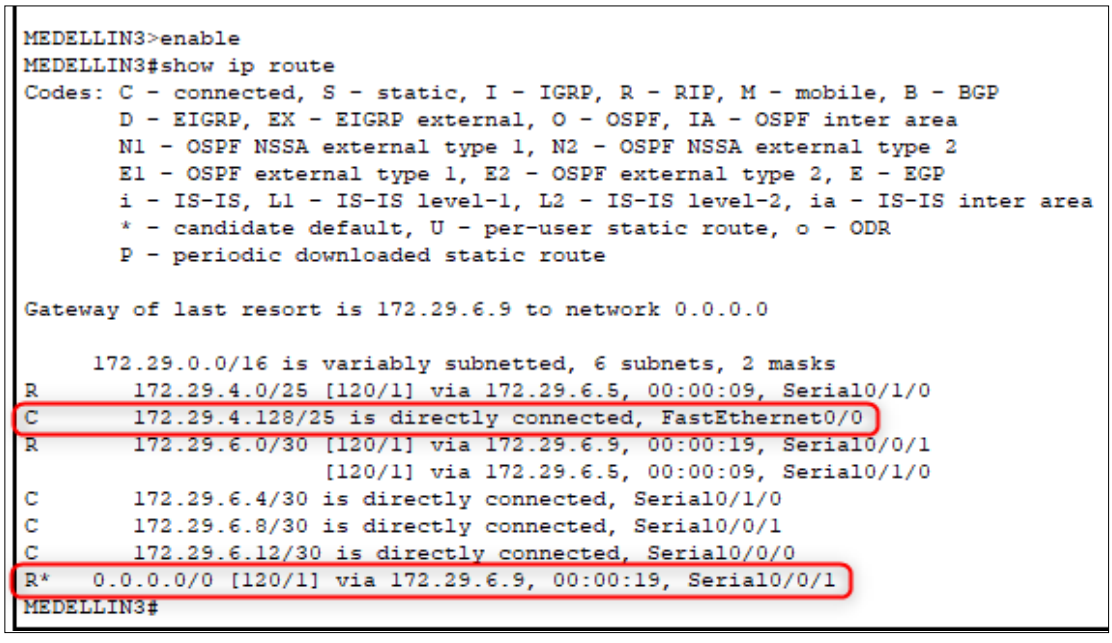


Figura 52 Verificar balanceo router MEDELLIN1 – Show ip route

```
MEDELLIN1#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 23 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
Interface Send Recv Triggered RIP Key-chain
Serial0/0/1 2 2
Serial0/1/0 2 2
Serial0/0/0 2 2
Serial0/1/1 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
172.29.0.0
209.17.220.0
Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update
209.17.220.1 120 00:00:03
172.29.6.2 120 00:00:16
172.29.6.14 120 00:00:09
172.29.6.10 120 00:00:09
Distance: (default is 120)
MEDELLIN1#
MEDELLIN1#debug ip packet
Packet debugging is on
MEDELLIN1#
```

IP: s=172.29.6.14 (Serial0/1/0), d=224.0.0.9 len 112, rcvd 2

IP: s=172.29.6.10 (Serial0/0/1), d=224.0.0.9 len 112, rcvd 2

IP: s=209.17.220.1 (Serial0/1/1), d=224.0.0.9 len 172, rcvd 2

IP: s=172.29.6.9 (local), d=224.0.0.9 (Serial0/0/1), len 272, sending broad/multicast

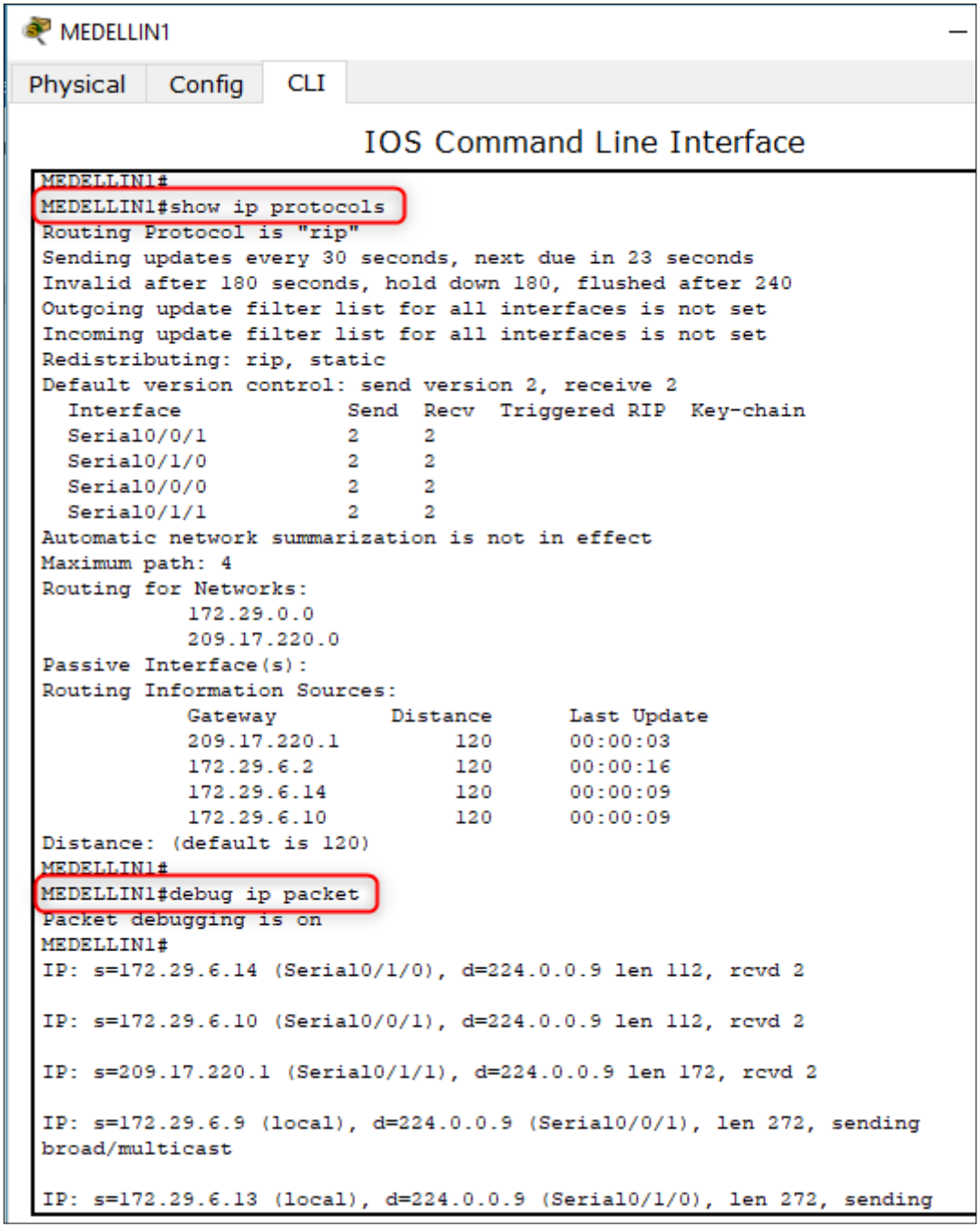


Figura 53 Verificar balanceo router MEDELLIN1 - Show ip protocols

Nota: Detenemos el debug con “no debug all”.

- **MEDELLIN3:**

MEDELLIN3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

172.29.0.0 /16 is variably subnetted, 6 subnets, 2 masks
R 172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:09, Serial0/1/0
C 172.29.4.128/25 is directly connected, FastEthernet0/0
R 172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
[120/1] via 172.29.6.5, 00:00:09, Serial0/1/0
C 172.29.6.4/30 is directly connected, Serial0/1/0
C 172.29.6.8/30 is directly connected, Serial0/0/1
C 172.29.6.12/30 is directly connected, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
MEDELLIN3#

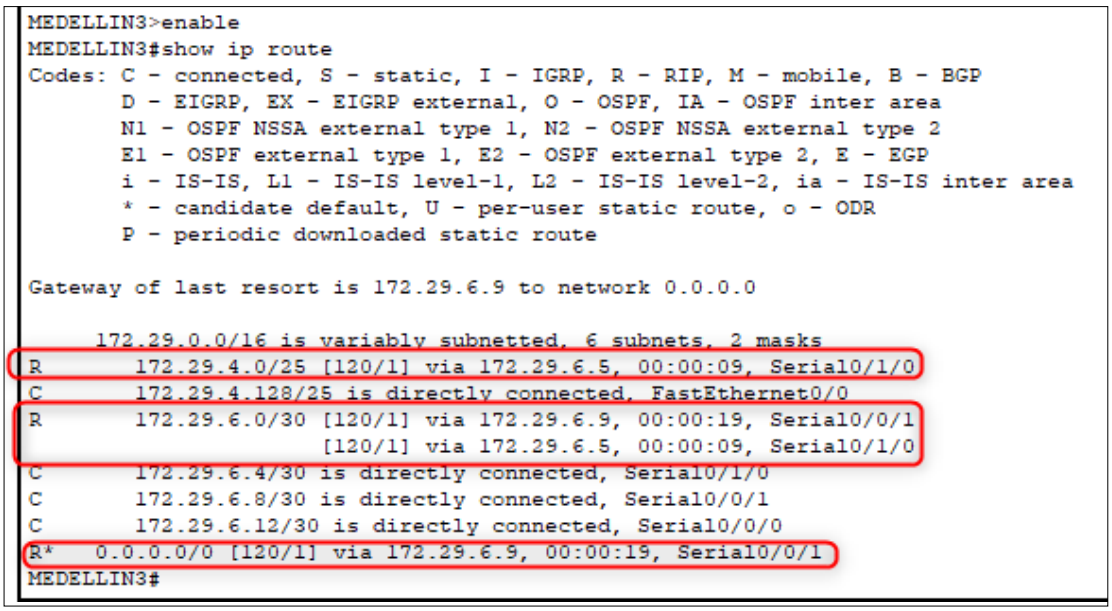


Figura 54 Verificar balanceo router MEDELLIN3 - Show ip route

MEDELLIN3>enable

MEDELLIN3#show ip protocols

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 27 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

FastEthernet0/0 2 2

Serial0/0/0 2 2

Serial0/1/0 2 2

Serial0/0/1 2 2

Automatic network summarization is not in effect

Maximum path: 4

Routing for Networks:

172.29.0.0

Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update
172.29.6.9 120 00:00:11
172.29.6.13 120 00:00:11
172.29.6.5 120 00:00:06
Distance: (default is 120)
MEDELLIN3#
MEDELLIN3#debug ip packet
Packet debugging is on
MEDELLIN3#
IP: s=172.29.6.9 (Serial0/0/1), d=224.0.0.9 len 272, rcvd 2
IP: s=172.29.6.13 (Serial0/0/0), d=224.0.0.9 len 272, rcvd 2
IP: s=172.29.6.5 (Serial0/1/0), d=224.0.0.9 len 232, rcvd 2
IP: s=172.29.4.129 (local), d=224.0.0.9 (FastEthernet0/0), len 312, sending broad/multicast
IP: s=172.29.6.14 (local), d=224.0.0.9 (Serial0/0/0), len 112, sending broad/multicast
IP: s=172.29.6.6 (local), d=224.0.0.9 (Serial0/1/0), len 272, sending broad/multicast
IP: s=172.29.6.10 (local), d=224.0.0.9 (Serial0/0/1), len 112, sending broad/multicast
IP: s=172.29.6.9 (Serial0/0/1), d=224.0.0.9 len 272, rcvd 2
IP: s=172.29.6.13 (Serial0/0/0), d=224.0.0.9 len 272, rcvd 2
IP: s=172.29.6.5 (Serial0/1/0), d=224.0.0.9 len 232, rcvd 2
no debug all
All possible debugging has been turned off
MEDELLIN3#

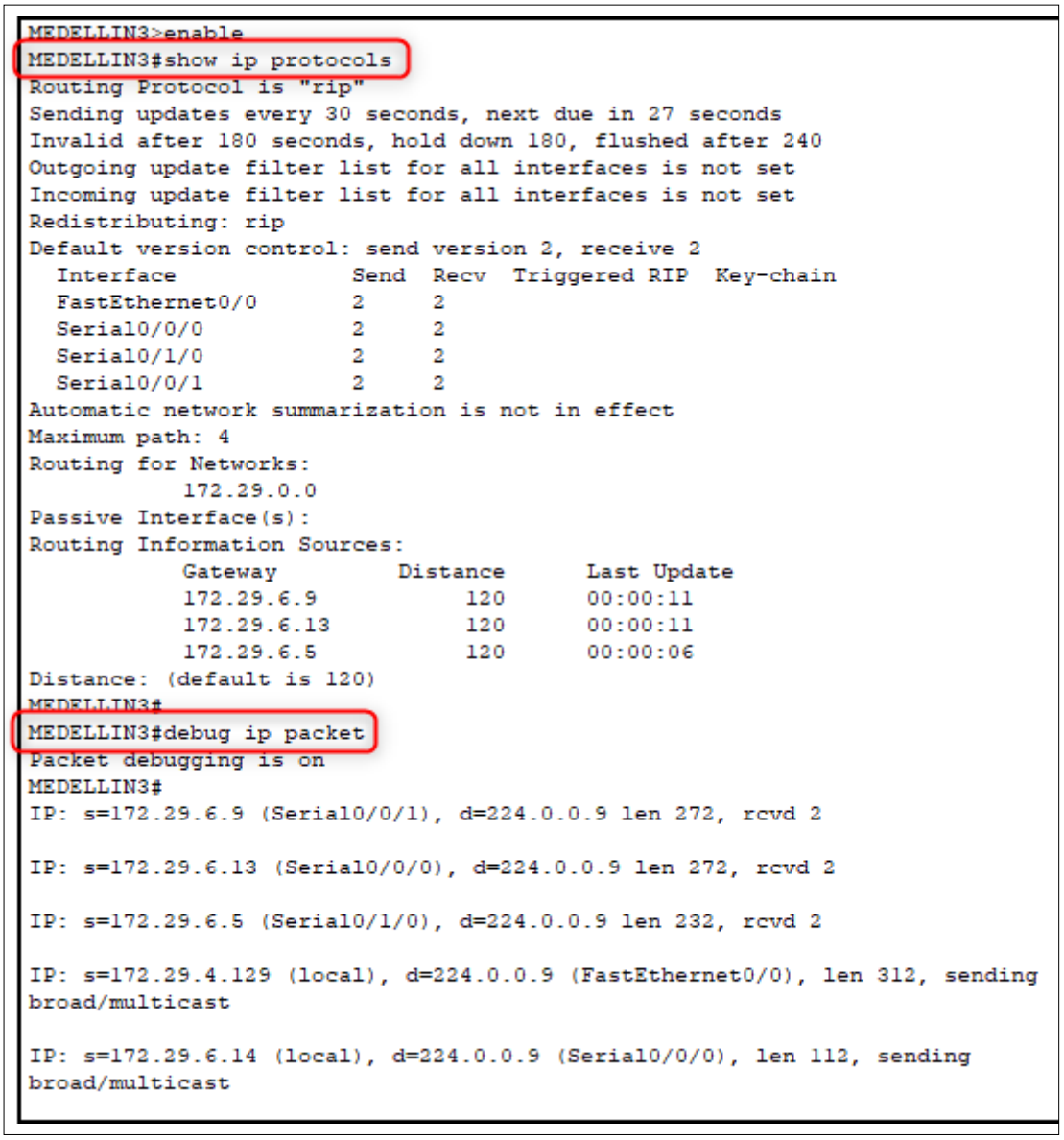


Figura 55 Verificar balanceo router MEDELLIN3 - Show ip protocols

Nota: Detenemos el debug con “no debug all”.

- **BOGOTA1:**

BOGOTA1#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R 172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:01, Serial0/1/1
[120/1] via 172.29.3.6, 00:00:01, Serial0/1/0
R 172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:13, Serial0/0/1
C 172.29.3.0/30 is directly connected, Serial0/1/1
C 172.29.3.4/30 is directly connected, Serial0/1/0
C 172.29.3.8/30 is directly connected, Serial0/0/1
R 172.29.3.12/30 [120/1] via 172.29.3.2, 00:00:01, Serial0/1/1
[120/1] via 172.29.3.6, 00:00:01, Serial0/1/0
[120/1] via 172.29.3.10, 00:00:13, Serial0/0/1
209.17.220.0 /30 is subnetted, 1 subnets
C 209.17.220.4 is directly connected, Serial0/0/0
S* 0.0.0.0/0 is directly connected, Serial0/1/1
is directly connected, Serial0/0/0
[1/0] via 209.17.220.5
BOGOTA1#

```
BOGOTA1>enable
BOGOTA1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R       172.29.0.0/24 [120/1] via 172.29.3.2, 00:00:01, Serial0/1/1
                      [120/1] via 172.29.3.6, 00:00:01, Serial0/1/0
R       172.29.1.0/24 [120/1] via 172.29.3.10, 00:00:13, Serial0/0/1
C       172.29.3.0/30 is directly connected, Serial0/1/1
C       172.29.3.4/30 is directly connected, Serial0/1/0
C       172.29.3.8/30 is directly connected, Serial0/0/1
R       172.29.3.12/30 [120/1] via 172.29.3.2, 00:00:01, Serial0/1/1
                       [120/1] via 172.29.3.6, 00:00:01, Serial0/1/0
                       [120/1] via 172.29.3.10, 00:00:13, Serial0/0/1
     209.17.220.0/30 is subnetted, 1 subnets
C       209.17.220.4 is directly connected, Serial0/0/0
S*   0.0.0.0/0 is directly connected, Serial0/1/1
                is directly connected, Serial0/0/0
                [1/0] via 209.17.220.5
BOGOTA1#
```

Figura 56 Verificar balanceo router BOGOTA1 - Show ip route

BOGOTA1>enable

BOGOTA1#show ip protocols

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 19 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip, static

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

Serial0/0/1 2 2

Serial0/1/1 2 2

Serial0/1/0 2 2

Serial0/0/0 2 2

Automatic network summarization is not in effect

Maximum path: 4
Routing for Networks:
172.29.0.0
209.17.220.0
Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update
172.29.3.6 120 00:00:16
172.29.3.2 120 00:00:16
172.29.3.10 120 00:00:26
209.17.220.5 120 00:00:13
Distance: (default is 120)
BOGOTA1#debug ip packet
Packet debugging is on
BOGOTA1#
IP: s=172.29.3.6 (Serial0/1/0), d=224.0.0.9 len 112, rcvd 2
IP: s=172.29.3.2 (Serial0/1/1), d=224.0.0.9 len 132, rcvd 2
IP: s=209.17.220.5 (Serial0/0/0), d=224.0.0.9 len 172, rcvd 2
IP: s=172.29.3.9 (local), d=224.0.0.9 (Serial0/0/1), len 272, sending broad/multicast
IP: s=172.29.3.1 (local), d=224.0.0.9 (Serial0/1/1), len 252, sending broad/multicast
IP: s=172.29.3.5 (local), d=224.0.0.9 (Serial0/1/0), len 272, sending broad/multicast
IP: s=209.17.220.6 (local), d=224.0.0.9 (Serial0/0/0), len 172, sending broad/multicast
IP: s=172.29.3.10 (Serial0/0/1), d=224.0.0.9 len 92, rcvd 2
no debug all
IP: s=209.17.220.5 (Serial0/0/0), d=224.0.0.9 len 172, rcvd 2
All possible debugging has been turned off
BOGOTA1#

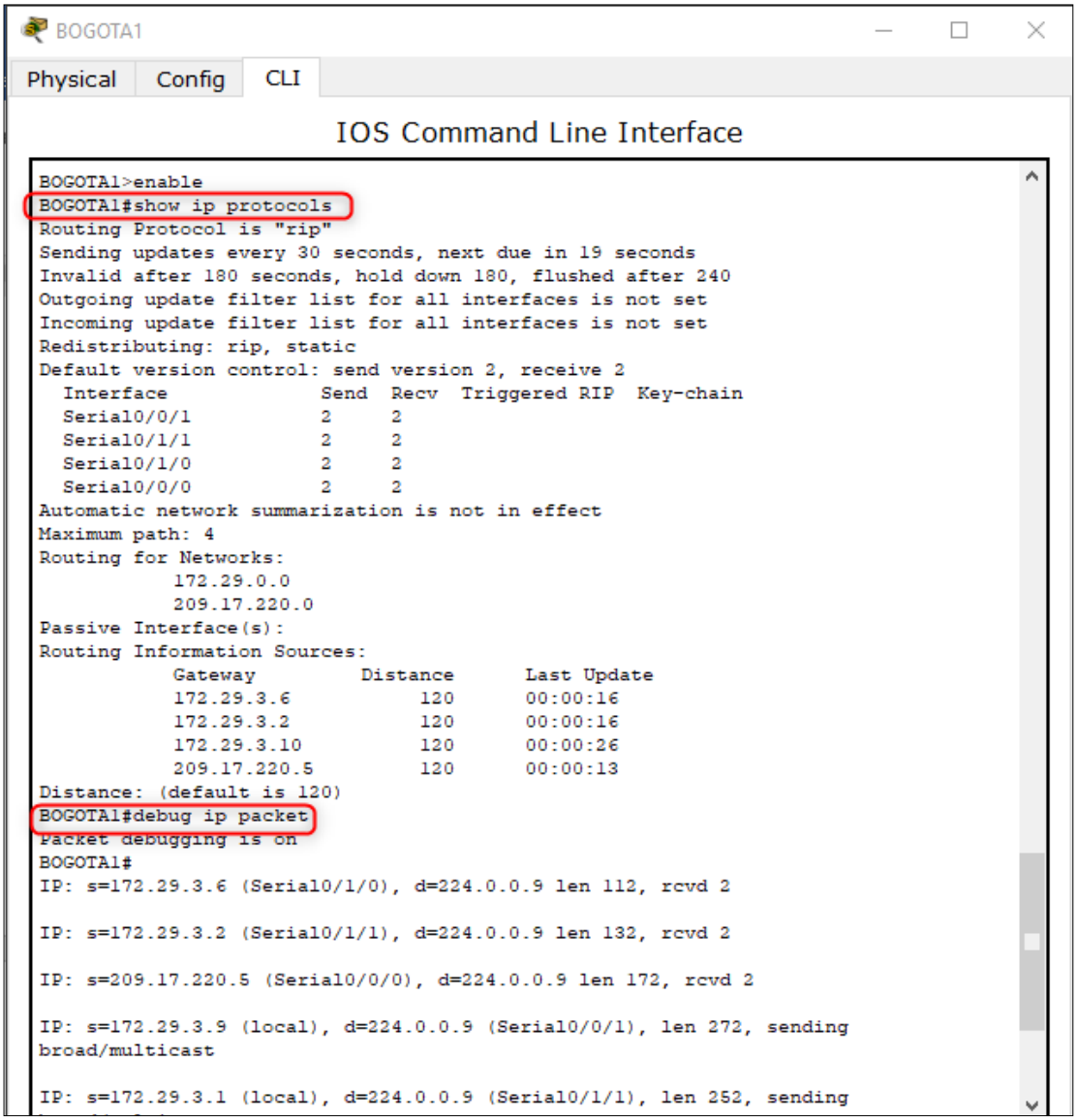


Figura 57 Verificar balanceo router BOGOTA1 - Show ip protocols

Nota: Detenemos el debug con “no debug all”.

- **BOGOTA3:**

BOGOTA3#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 172.29.3.1 to network 0.0.0.0

172.29.0.0 /16 is variably subnetted, 6 subnets, 2 masks
C 172.29.0.0/24 is directly connected, FastEthernet0/0
R 172.29.1.0/24 [120/1] via 172.29.3.13, 00:00:15, Serial0/1/0
C 172.29.3.0/30 is directly connected, Serial0/0/0
C 172.29.3.4/30 is directly connected, Serial0/0/1
R 172.29.3.8/30 [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
[120/1] via 172.29.3.5, 00:00:26, Serial0/0/1
[120/1] via 172.29.3.13, 00:00:15, Serial0/1/0
C 172.29.3.12/30 is directly connected, Serial0/1/0
209.17.220.0/30 is subnetted, 1 subnets
R 209.17.220.4 [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
[120/1] via 172.29.3.5, 00:00:26, Serial0/0/1
R* 0.0.0.0/0 [120/1] via 172.29.3.1, 00:00:26, Serial0/0/0
[120/1] via 172.29.3.5, 00:00:26, Serial0/0/1
BOGOTA3#

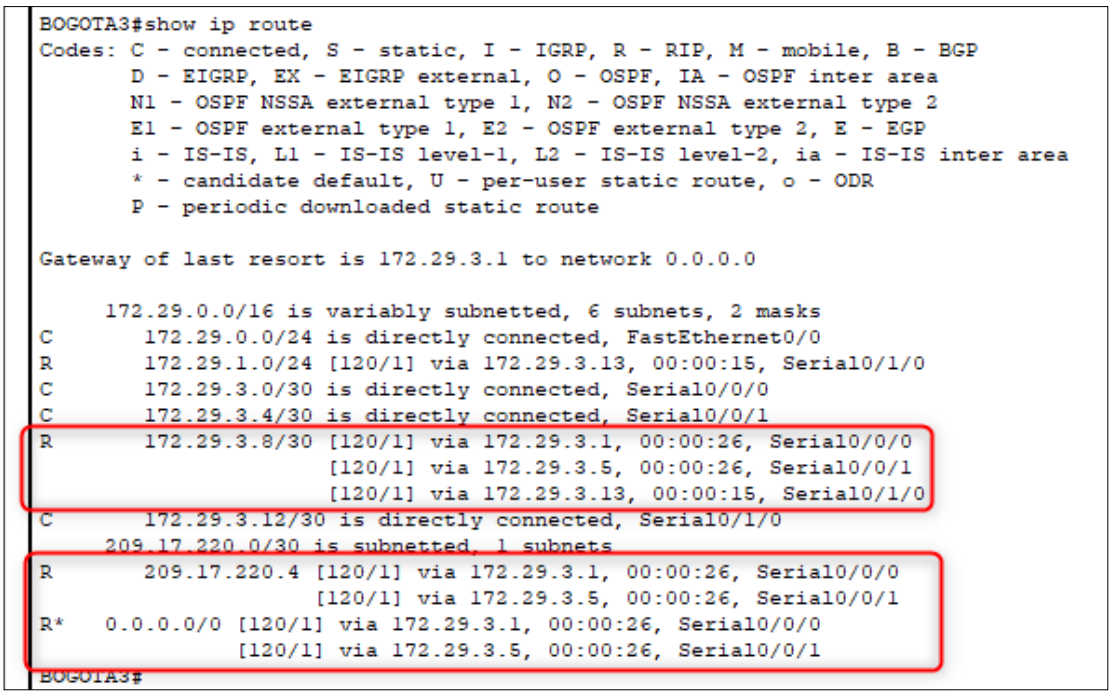


Figura 58 Verificar balanceo router BOGOTA3 - Show ip route

BOGOTA3>enable

BOGOTA3#show ip protocols

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 20 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

FastEthernet0/0 2 2

Serial0/0/1 2 2

Serial0/0/0 2 2

Serial0/1/0 2 2

Automatic network summarization is not in effect

Maximum path: 4
Routing for Networks:
172.29.0.0
Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update
172.29.3.5 120 00:00:27
172.29.3.13 120 00:00:16
172.29.3.1 120 00:00:27
Distance: (default is 120)
BOGOTA3#debug ip packet
Packet debugging is on
BOGOTA3#
IP: s=172.29.3.13 (Serial0/1/0), d=224.0.0.9 len 252, rcvd 2
IP: s=172.29.0.1 (local), d=224.0.0.9 (FastEthernet0/0), len 312, sending broad/multicast
IP: s=172.29.3.6 (local), d=224.0.0.9 (Serial0/0/1), len 112, sending broad/multicast
IP: s=172.29.3.2 (local), d=224.0.0.9 (Serial0/0/0), len 132, sending broad/multicast
IP: s=172.29.3.14 (local), d=224.0.0.9 (Serial0/1/0), len 272, sending broad/multicast
no debug all
All possible debugging has been turned off
BOGOTA3#

```
BOGOTA3>enable
BOGOTA3#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 20 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  FastEthernet0/0        2     2
  Serial0/0/1            2     2
  Serial0/0/0            2     2
  Serial0/1/0            2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.3.5           120      00:00:27
           172.29.3.13          120      00:00:16
           172.29.3.1           120      00:00:27
Distance: (default is 120)
BOGOTA3#debug ip packet
Packet debugging is on
BOGOTA3#
IP: s=172.29.3.13 (Serial0/1/0), d=224.0.0.9 len 252, rcvd 2

IP: s=172.29.0.1 (local), d=224.0.0.9 (FastEthernet0/0), len 312, sending
broad/multicast

IP: s=172.29.3.6 (local), d=224.0.0.9 (Serial0/0/1), len 112, sending
broad/multicast

IP: s=172.29.3.2 (local), d=224.0.0.9 (Serial0/0/0), len 132, sending
broad/multicast

IP: s=172.29.3.14 (local), d=224.0.0.9 (Serial0/1/0), len 272, sending
```

Figura 59 Verificar balanceo router BOGOTA3 - Show ip protocols

Nota: Detenemos el debug con “no debug all”.

- **ISP:**

ISP>enable

ISP#show ip protocols

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 23 seconds

Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
Interface Send Recv Triggered RIP Key-chain
Serial0/0/0 2 2
Serial0/0/1 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
209.17.220.0
Passive Interface(s):
Routing Information Sources:
Gateway Distance Last Update
209.17.220.2 120 00:00:02
209.17.220.6 120 00:00:01
Distance: (default is 120)
ISP#debug ip packet
Packet debugging is on
ISP#
IP: s=209.17.220.1 (local), d=224.0.0.9 (Serial0/0/0), len 172, sending broad/multicast
IP: s=209.17.220.5 (local), d=224.0.0.9 (Serial0/0/1), len 172, sending broad/multicast
IP: s=209.17.220.2 (Serial0/0/0), d=224.0.0.9 len 172, rcvd 2
IP: s=209.17.220.6 (Serial0/0/1), d=224.0.0.9 len 172, rcvd 2
no debug all
All possible debugging has been turned off

```
ISP>enable
ISP#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 23 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/0/0            2     2
  Serial0/0/1            2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           209.17.220.0
Passive Interface(s):
Routing Information Sources:
           Gateway         Distance      Last Update
           209.17.220.2         120      00:00:02
           209.17.220.6         120      00:00:01
Distance: (default is 120)
ISP#debug ip packet
Packet debugging is on
ISP#
IP: s=209.17.220.1 (local), d=224.0.0.9 (Serial0/0/0), len 172, sending
broad/multicast

IP: s=209.17.220.5 (local), d=224.0.0.9 (Serial0/0/1), len 172, sending
broad/multicast

IP: s=209.17.220.2 (Serial0/0/0), d=224.0.0.9 len 172, rcvd 2

IP: s=209.17.220.6 (Serial0/0/1), d=224.0.0.9 len 172, rcvd 2
no debug all
All possible debugging has been turned off
ISP#
```

Figura 60 Verificar balanceo router ISP - Show ip protocols

c. Obsérvese en los routers Bogotá1 y Medellín1 cierta similitud por su ubicación, por tener dos enlaces de conexión hacia otro router y por la ruta por defecto que manejan.

- **MEDELLIN1:**

```
MEDELLIN1#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 28 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/0/1            2     2
  Serial0/1/0            2     2
  Serial0/0/0            2     2
  Serial0/1/1            2     2
Automatic network summarization is not in effect
Maximum path: 4
```

Figura 61 Observar similitud router MEDELLIN1 de BOGOTA1

- **BOGOTA1:**

```
BOGOTA1#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 13 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/0/1            2     2
  Serial0/1/1            2     2
  Serial0/1/0            2     2
  Serial0/0/0            2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
```

Figura 62 Observar similitud router BOGOTA1 de MEDELLIN1

d. Los routers Medellín2 y Bogotá2 también presentan redes conectadas directamente y recibidas mediante RIP.

- **MEDELLIN2:**

```
MEDELLIN2>ENABLE
MEDELLIN2#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 6 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  FastEthernet0/0       2     2
  Serial0/0/1           2     2
  Serial0/0/0           2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.6.6            120      00:00:01
           172.29.6.1            120      00:00:13
Distance: (default is 120)
MEDELLIN2#
```

Figura 63 Red RIP router MEDELLIN2

- **BOGOTA2:**

```
BOGOTA2#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 3 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  FastEthernet0/0       2     2
  Serial0/0/1           2     2
  Serial0/0/0           2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
Passive Interface(s):
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.3.9            120      00:00:27
           172.29.3.14           120      00:00:02
Distance: (default is 120)
BOGOTA2#
```

Figura 64 Red RIP router BOGOTA2

e. Las tablas de los routers restantes deben permitir visualizar rutas redundantes para el caso de la ruta por defecto.

- **MEDELLIN3:**

Cuando hay mas de un camino, son rutas redundantes:

```
MEDELLIN3>enable
MEDELLIN3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.29.6.9 to network 0.0.0.0

     172.29.0.0/16 is variably subnetted, 6 subnets, 2 masks
R       172.29.4.0/25 [120/1] via 172.29.6.5, 00:00:09, Serial0/1/0
C       172.29.4.128/25 is directly connected, FastEthernet0/0
R       172.29.6.0/30 [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
                      [120/1] via 172.29.6.5, 00:00:09, Serial0/1/0
C       172.29.6.4/30 is directly connected, Serial0/1/0
C       172.29.6.8/30 is directly connected, Serial0/0/1
C       172.29.6.12/30 is directly connected, Serial0/0/0
R*   0.0.0.0/0 [120/1] via 172.29.6.9, 00:00:19, Serial0/0/1
```

Figura 65 Rutas redundantes MEDELLIN3

```
MEDELLIN3#
MEDELLIN3#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 1 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  FastEthernet0/0       2     2
  Serial0/0/0           2     2
  Serial0/1/0           2     2
  Serial0/0/1           2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
          172.29.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.29.6.9           120      00:00:16
          172.29.6.13          120      00:00:16
          172.29.6.5           120      00:00:20
Distance: (default is 120)
MEDELLIN3#
MEDELLIN3#
```

- **BOGOTA 3:**

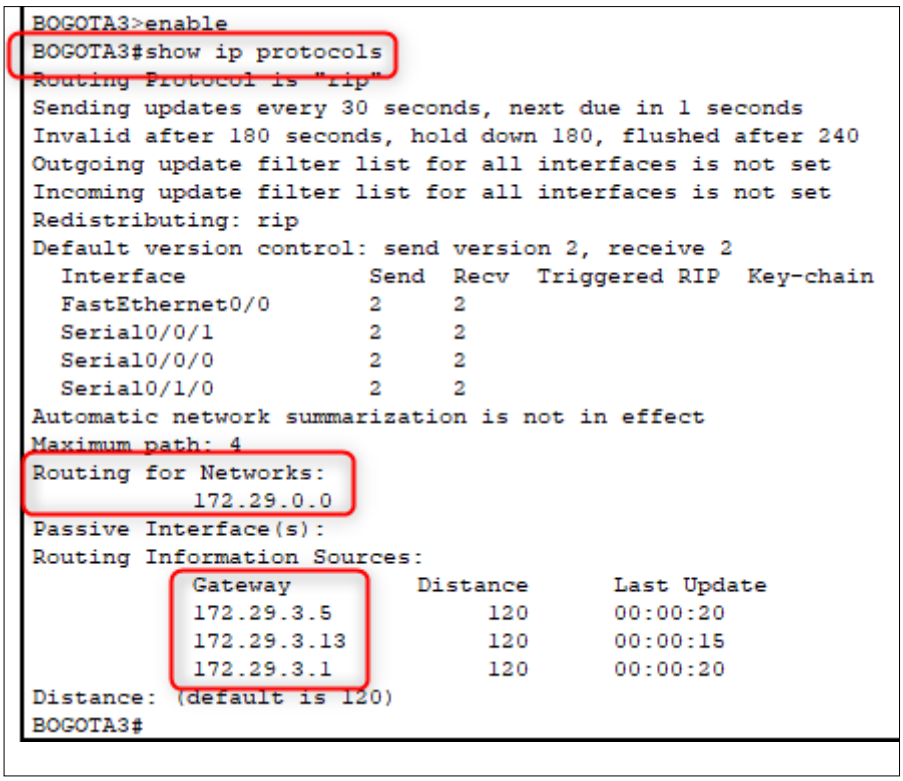


Figura 66 Rutas redundantes BOGOTA3

f. El router ISP solo debe indicar sus rutas estáticas adicionales a las directamente conectadas.

ISP>enable

ISP#show ip protocols

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 12 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

Serial0/0/0 2 2

Serial0/0/1 2 2

Automatic network summarization is not in effect

Maximum path: 4

Routing for Networks:

209.17.220.0

Passive Interface(s):

Routing Information Sources:

Gateway Distance Last Update

209.17.220.2 120 00:00:23

209.17.220.6 120 00:00:22

Distance: (default is 120)

ISP#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is 209.17.220.2 to network 0.0.0.0

172.29.0.0/16 is variably subnetted, 14 subnets, 4 masks

S 172.29.0.0/22 is directly connected, Serial0/0/1

R 172.29.0.0/24 [120/2] via 209.17.220.6, 00:00:09, Serial0/0/1

R 172.29.1.0/24 [120/2] via 209.17.220.6, 00:00:09, Serial0/0/1

R 172.29.3.0/30 [120/1] via 209.17.220.6, 00:00:09, Serial0/0/1

R 172.29.3.4/30 [120/1] via 209.17.220.6, 00:00:09, Serial0/0/1

R 172.29.3.8/30 [120/1] via 209.17.220.6, 00:00:09, Serial0/0/1

R 172.29.3.12/30 [120/2] via 209.17.220.6, 00:00:09, Serial0/0/1

S 172.29.4.0/22 is directly connected, Serial0/0/0

R 172.29.4.0/25 [120/2] via 209.17.220.2, 00:00:09, Serial0/0/0

R 172.29.4.128/25 [120/2] via 209.17.220.2, 00:00:09, Serial0/0/0

R 172.29.6.0/30 [120/1] via 209.17.220.2, 00:00:09, Serial0/0/0

R 172.29.6.4/30 [120/2] via 209.17.220.2, 00:00:09, Serial0/0/0

R 172.29.6.8/30 [120/1] via 209.17.220.2, 00:00:09, Serial0/0/0

R 172.29.6.12/30 [120/1] via 209.17.220.2, 00:00:09, Serial0/0/0

209.17.220.0/30 is subnetted, 2 subnets

C 209.17.220.0 is directly connected, Serial0/0/0

C 209.17.220.4 is directly connected, Serial0/0/1

R* 0.0.0.0/0 [120/1] via 209.17.220.2, 00:00:09, Serial0/0/0

[120/1] via 209.17.220.6, 00:00:09, Serial0/0/1

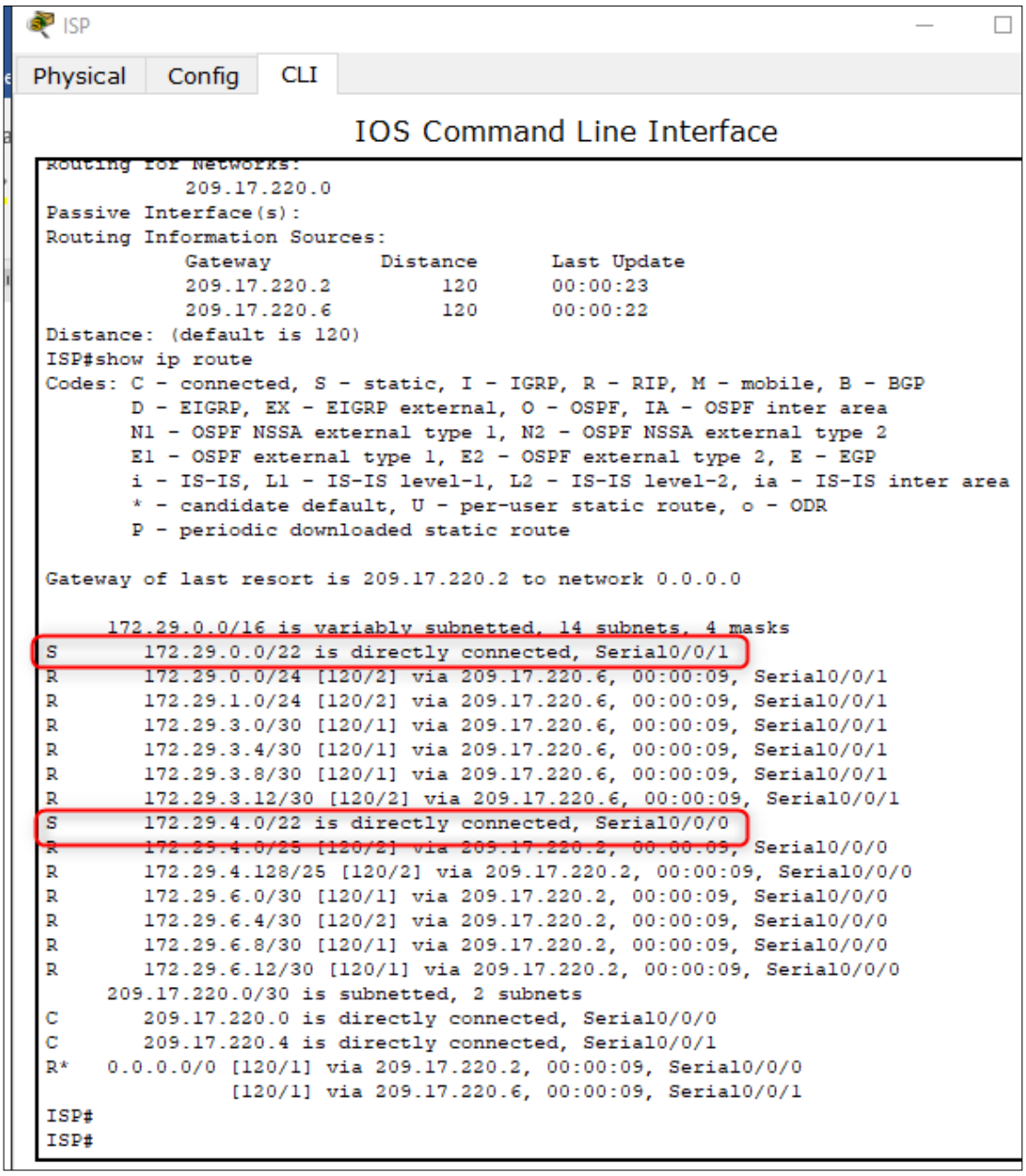


Figura 67 Rutas estáticas y adicionales router ISP

1.1.3 Parte 3: Deshabilitar la propagación del protocolo RIP.

a. Para no propagar las publicaciones por interfaces que no lo requieran se debe deshabilitar la propagación del protocolo RIP, en la siguiente tabla se indican las interfaces de cada router que no necesitan desactivación.

ROUTER	INTERFAZ
Bogota1	SERIAL0/0/1; SERIAL0/1/0; SERIAL0/1/1
Bogota2	SERIAL0/0/0; SERIAL0/0/1
Bogota3	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
Medellín1	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/1
Medellín2	SERIAL0/0/0; SERIAL0/0/1
Medellín3	SERIAL0/0/0; SERIAL0/0/1; SERIAL0/1/0
ISP	No lo requiere

*Utilizamos el comando de configuración del **router passive-interface** para evitar que las actualizaciones de routing se transmitan a través del router.*

- El router sabe llegar a la IP 209.17.225.5 a través de la interfaz S0/0/0 del router de BOGOTA1, por lo tanto, la vamos a desactivar:

BOGOTA1#
BOGOTA1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA1(config)#passive-interface serial0/0/0
^
% Invalid input detected at '^' marker.
BOGOTA1(config)#router rip

BOGOTA1(config-router)#version 2

BOGOTA1(config-router)#passive-interface serial0/0/0

BOGOTA1(config-router)#exit

BOGOTA1(config)#exit

BOGOTA1#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA1#

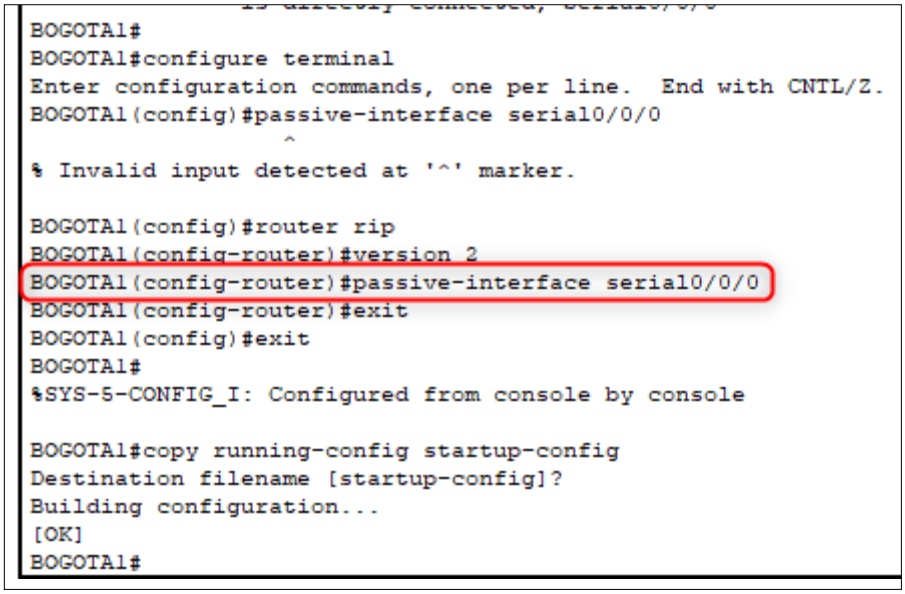


Figura 68 Deshabilitar propagación del protocolo RIP router BOGOTA1

- El router sabe llegar a la IP 172.29.6.2 a través de la interfaz S0/0/0 del router de MEDELLIN1, por lo tanto, la vamos a desactivar:

MEDELLIN1#

MEDELLIN1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN1(config)#router rip

MEDELLIN1(config-router)#version 2

MEDELLIN1(config-router)#passive-interface serial0/0/0

MEDELLIN1(config-router)#exit

MEDELLIN1(config)#exit

MEDELLIN1#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#

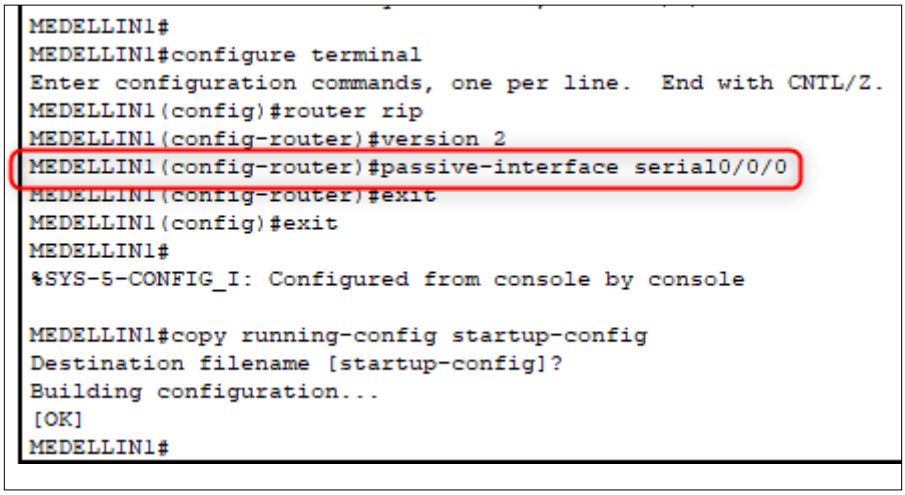


Figura 69 Deshabilitar propagación del protocolo RIP router MEDELLIN1

- Desactivamos la F0/0 del router de BOGOTA2:

BOGOTA2>enable

BOGOTA2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA2(config)#router rip

BOGOTA2(config-router)#version 2

BOGOTA2(config-router)#passive-interface f0/0

BOGOTA2(config-router)#exit

BOGOTA2(config)#exit

BOGOTA2#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA2#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA2#

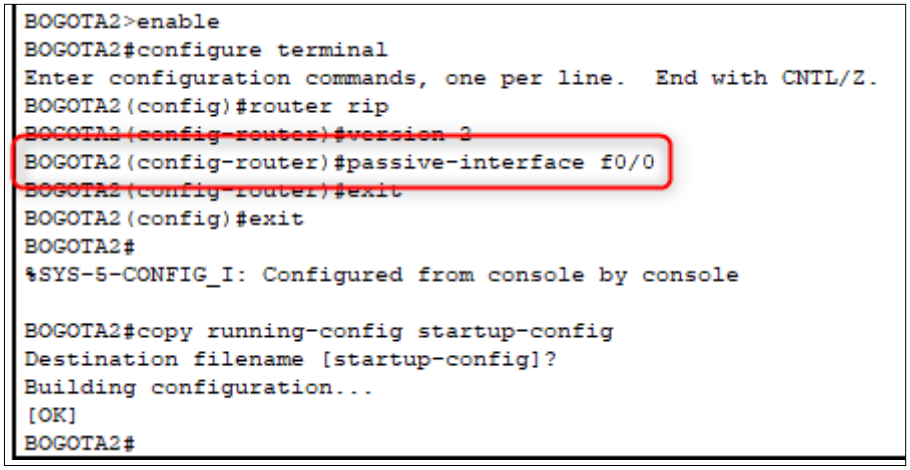


Figura 70 Deshabilitar propagación del protocolo RIP router BOGOTA2

- Desactivamos la F0/0 del router de BOGOTA3:

BOGOTA3>enable

BOGOTA3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA3(config)#router rip

BOGOTA3(config-router)#version 2

BOGOTA3(config-router)#passive-interface f0/0

BOGOTA3(config-router)#exit

BOGOTA3(config)#exit

BOGOTA3#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA3#

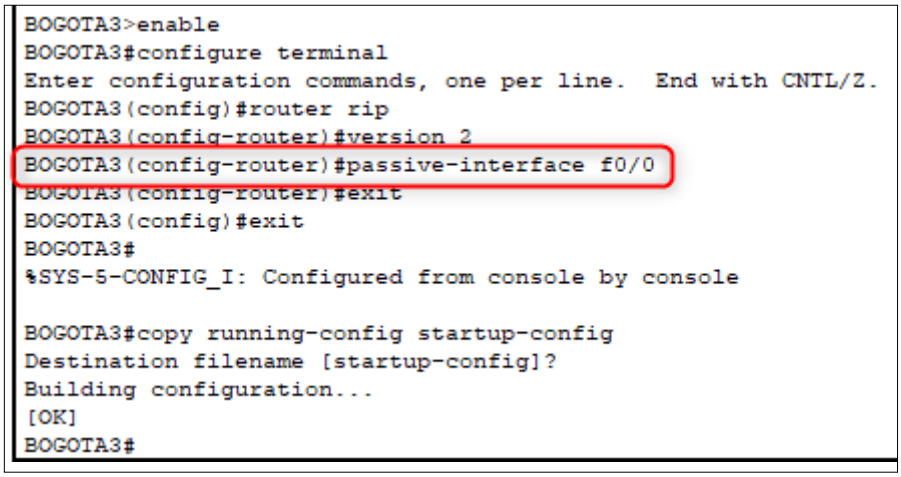


Figura 71 Deshabilitar propagación del protocolo RIP router BOGOTA3

- Desactivamos la F0/0 del router de MEDELLIN2:

MEDELLIN2>enable

MEDELLIN2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN2(config)#router rip

MEDELLIN2(config-router)#version 2

MEDELLIN2(config-router)#passive-interface f0/0

MEDELLIN2(config-router)#exit

MEDELLIN2(config)#exit

MEDELLIN2#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN2#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN2#

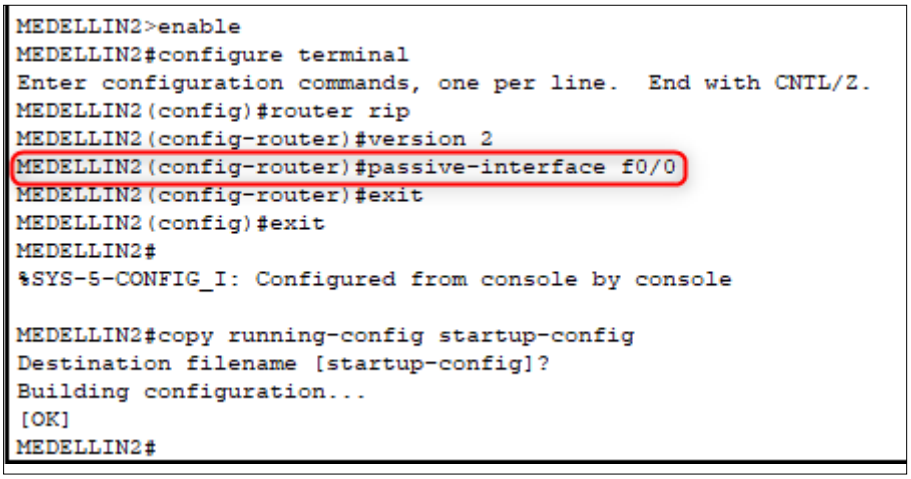


Figura 72 Deshabilitar propagación del protocolo RIP router MEDELLIN2

- Desactivamos la F0/0 del router de MEDELLIN3:

MEDELLIN3>enable

MEDELLIN3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN3(config)#router rip

MEDELLIN3(config-router)#version 2

MEDELLIN3(config-router)#passive-interface f0/0

MEDELLIN3(config-router)#exit

MEDELLIN3(config)#exit

MEDELLIN3#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN3#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN3#

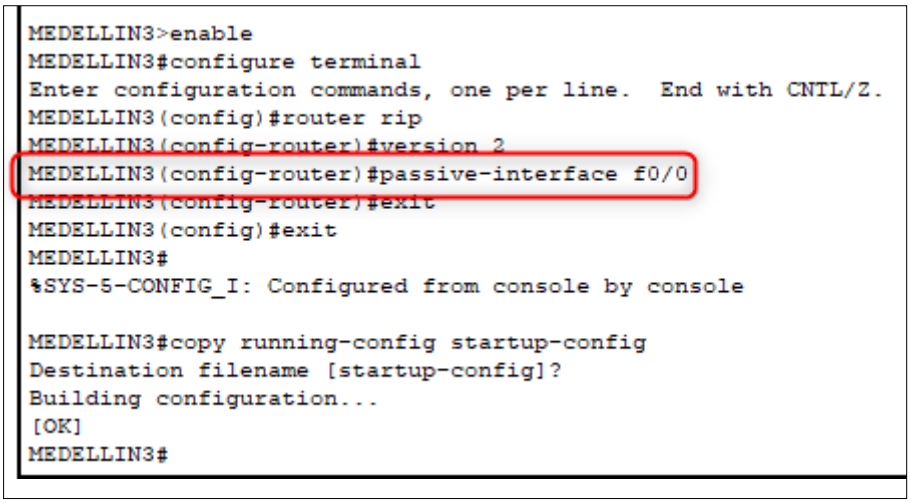


Figura 73 Deshabilitar propagación del protocolo RIP router MEDELLIN3

- Desactivamos la S0/0/0 y S0/0/1 del router de ISP:

ISP#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

ISP(config)#passive-interface serial0/0/0

^

% Invalid input detected at '^' marker.

ISP(config)#router rip

ISP(config-router)#version 2

ISP(config-router)#passive-interface serial0/0/0

ISP(config-router)#passive-interface serial0/0/1

ISP(config-router)#exit

ISP(config)#exit

ISP#

%SYS-5-CONFIG_I: ConFigurad from console by console

ISP#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

ISP#

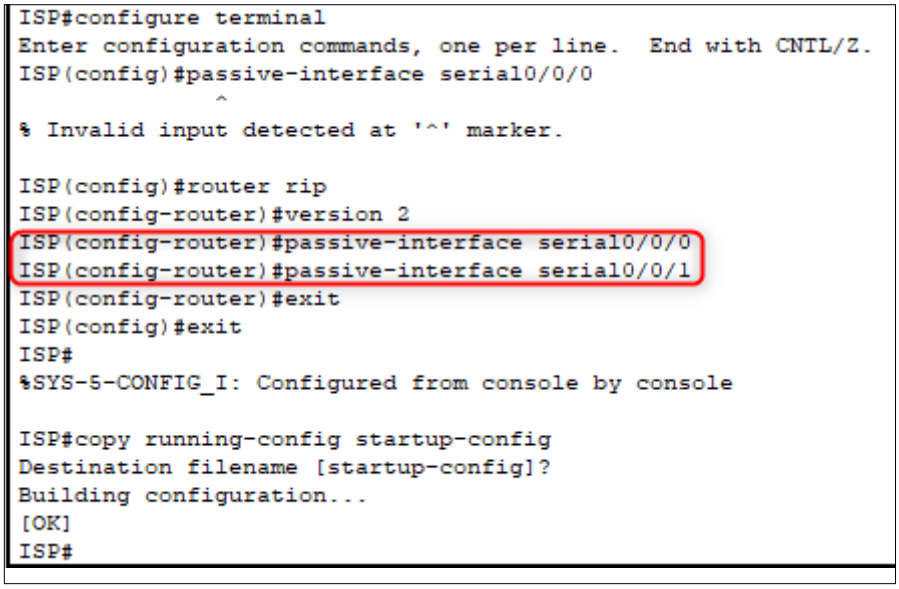


Figura 74 Deshabilitar propagación del protocolo RIP router ISP

1.1.4 Parte 4: Verificación del protocolo RIP.

a. Verificar y documentar las opciones de enrutamiento configuradas en los routers, como el passive interface para la conexión hacia el ISP, la versión de RIP y las interfaces que participan de la publicación entre otros datos.

A los comandos que hemos ejecutado anteriormente, visualizaremos el passive interface:

- **Ejecutamos el comando "show ip protocol" en el router MEDELLIN1:**

MEDELLIN1#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 23 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
Interface Send Recv Triggered RIP Key-chain
Serial0/1/0 2 2
Serial0/0/1 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
172.29.0.0
209.17.220.0
Passive Interface(s):
Serial0/0/0

Routing Information Sources:

Gateway Distance Last Update

172.29.6.2 120 00:00:03

172.29.6.10 120 00:00:20

172.29.6.14 120 00:00:20

Distance: (default is 120)

MEDELLIN1#

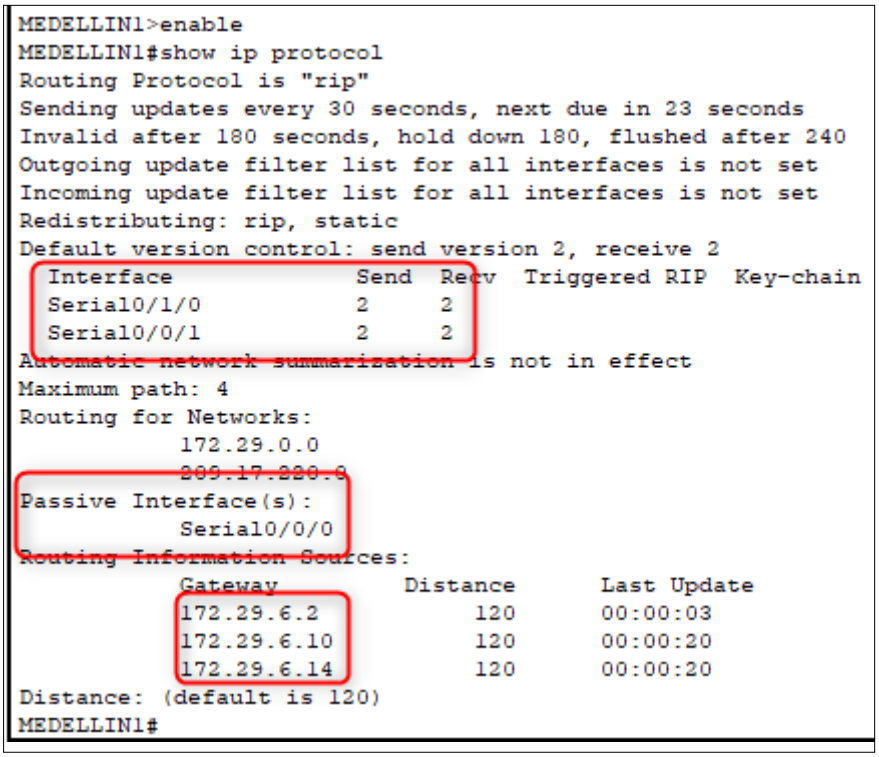


Figura 75 Verificar protocolo RIP router MEDELLIN1

- **Ejecutamos el comando “show ip protocol” en el router MEDELLIN2:**

MEDELLIN2#show ip protocol

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 2 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
Interface Send Recv Triggered RIP Key-chain
Serial0/0/1 2 2
Serial0/0/0 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
172.29.0.0
Passive Interface(s):
FastEthernet0/0
Routing Information Sources:
Gateway Distance Last Update
172.29.6.6 120 00:00:20
Distance: (default is 120)
MEDELLIN2#

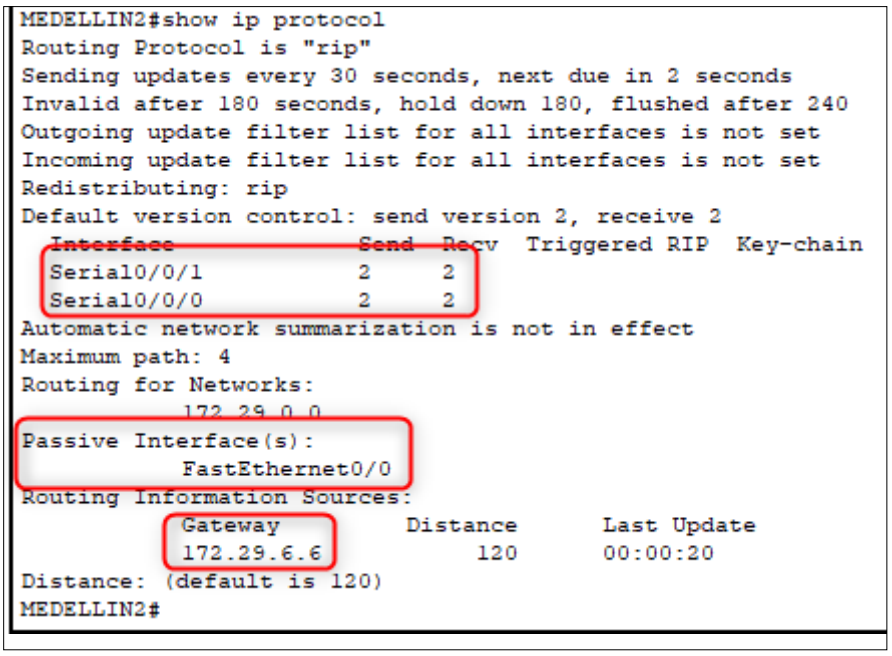


Figura 76 Verificar protocolo RIP router MEDELLIN2

- **Ejecutamos el comando "show ip protocol" en el router MEDELLIN3:**

MEDELLIN3#show ip protocol

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 6 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

Serial0/1/0 2 2

Serial0/0/1 2 2

Serial0/0/0 2 2

Automatic network summarization is not in effect

Maximum path: 4

Routing for Networks:

172.29.0.0

Passive Interface(s):

FastEthernet0/0

Routing Information Sources:

Gateway Distance Last Update

172.29.6.9 120 00:00:03

172.29.6.5 120 00:00:02

Distance: (default is 120)

MEDELLIN3#

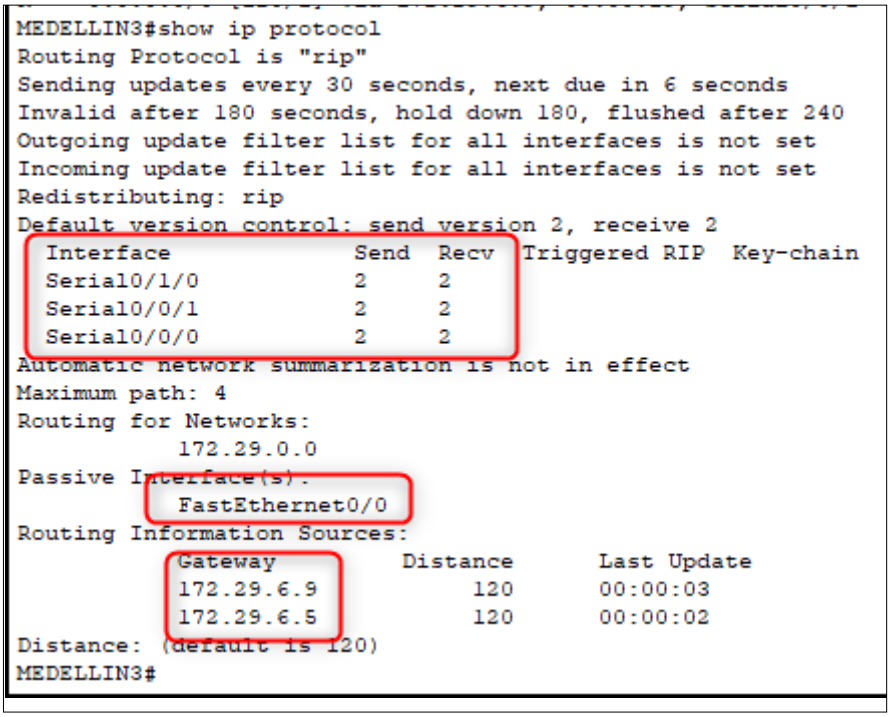


Figura 77 Verificar protocolo RIP router MEDELLIN3

- **Ejecutamos el comando “show ip protocol” en el router BOGOTA1:**

BOGOTA1#show ip protocol

Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 12 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
Interface Send Recv Triggered RIP Key-chain
Serial0/1/1 2 2
Serial0/0/1 2 2
Serial0/1/0 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
172.29.0.0
209.17.220.0
Passive Interface(s):
Serial0/0/0
Routing Information Sources:
Gateway Distance Last Update
172.29.3.2 120 00:00:22
172.29.3.6 120 00:00:22
172.29.3.10 120 00:00:10
Distance: (default is 120)
BOGOTA1#

```
BOGOTA1#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 12 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip, static
Default version control: send version 2, receive 2
  Interface              Send  Recv  Triggered RIP  Key-chain
  Serial0/1/1            2     2
  Serial0/0/1            2     2
  Serial0/1/0            2     2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
           172.29.0.0
           209.17.220.0
Passive Interface(s):
           Serial0/0/0
Routing Information Sources:
           Gateway         Distance      Last Update
           172.29.3.2           120      00:00:22
           172.29.3.6           120      00:00:22
           172.29.3.10          120      00:00:10
Distance: (default is 120)
BOGOTA1#
```

Figura 78 Verificar protocolo RIP router BOGOTA1

- **Ejecutamos el comando "show ip protocol" en el router BOGOTA2:**

BOGOTA2>enable

BOGOTA2#show ip protocol

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 15 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

Serial0/0/1 2 2

Serial0/0/0 2 2

Automatic network summarization is not in effect

Maximum path: 4

Routing for Networks:

172.29.0.0

Passive Interface(s):

FastEthernet0/0

Routing Information Sources:

Gateway Distance Last Update

172.29.3.9 120 00:00:17

172.29.3.14 120 00:00:22

Distance: (default is 120)

BOGOTA2#

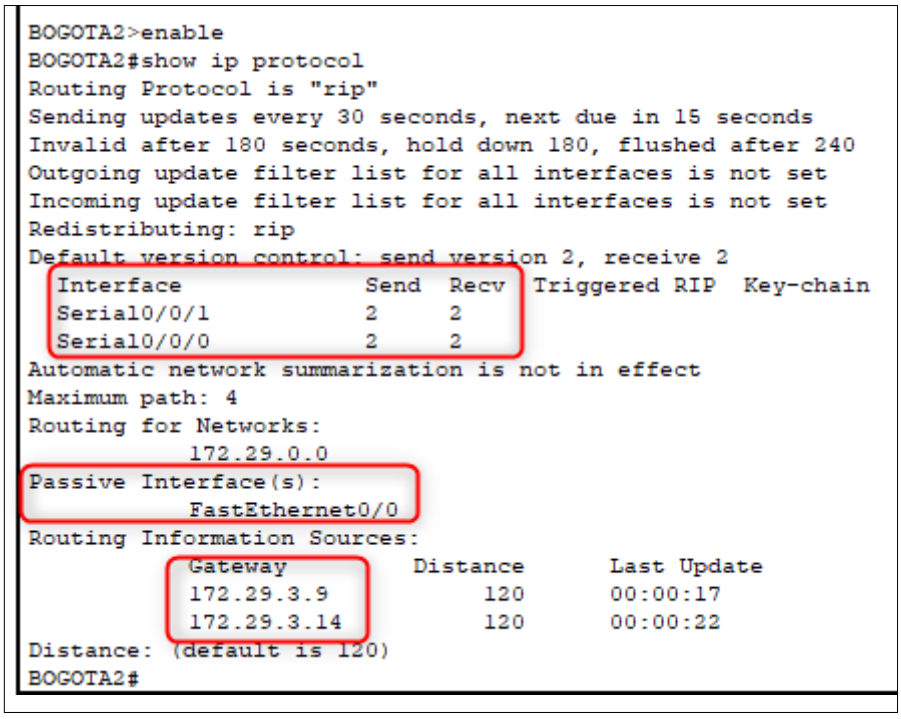


Figura 79 Verificar protocolo RIP router BOGOTA2

- **Ejecutamos el comando “show ip protocol” en el router BOGOTA3:**

BOGOTA3#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 9 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
Interface Send Recv Triggered RIP Key-chain
Serial0/1/0 2 2
Serial0/0/0 2 2
Serial0/0/1 2 2
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
172.29.0.0
Passive Interface(s):
FastEthernet0/0
Routing Information Sources:
Gateway Distance Last Update
172.29.3.1 120 00:00:10
172.29.3.5 120 00:00:10
172.29.3.13 120 00:00:07
Distance: (default is 120)
BOGOTA3#

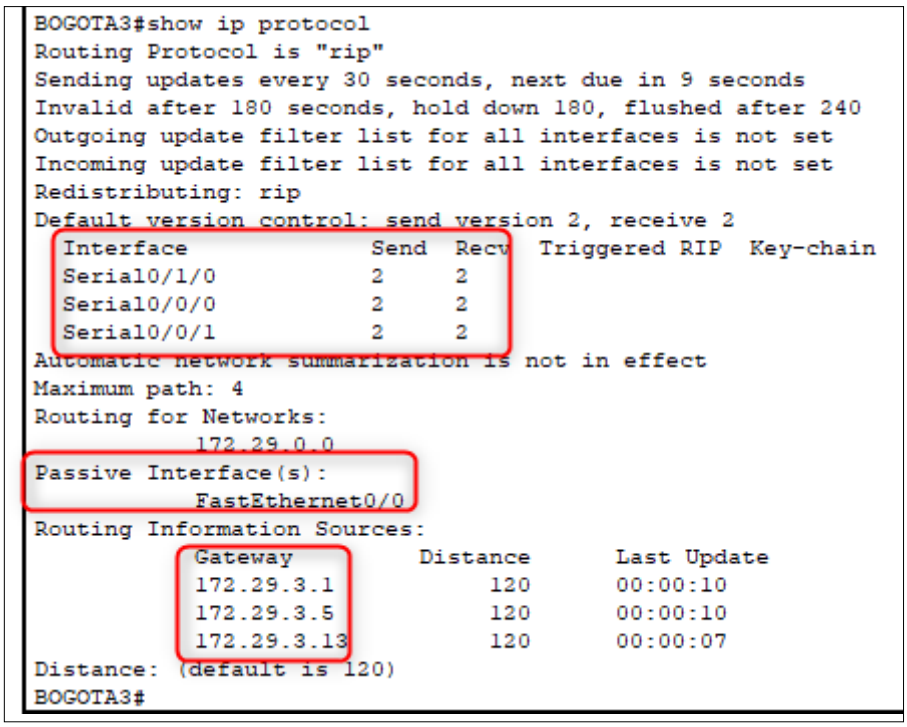


Figura 80 Verificar protocolo RIP router BOGOTA3

- **Ejecutamos el comando “show ip protocol” en el router ISP:**

ISP#show ip protocol

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 12 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

Automatic network summarization is not in effect

Maximum path: 4

Routing for Networks:

209.17.220.0

Passive Interface(s):

Serial0/0/0

Serial0/0/1

Routing Information Sources:

Gateway Distance Last Update

Distance: (default is 120)

ISP#

```
ISP#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 12 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
            209.17.220.0
Passive Interface(s):
            Serial0/0/0
            Serial0/0/1
Routing Information Sources:
            Gateway         Distance      Last Update
Distance: (default is 120)
ISP#
```

Figura 81 Verificar protocolo RIP router ISP

b. Verificar y documentar la base de datos de RIP de cada router, donde se informa de manera detallada de todas las rutas hacia cada red.

1.1.5 Parte 5: Configurar encapsulamiento y autenticación PPP.

a. Según la topología se requiere que el enlace Medellín1 con ISP sea configurado con autenticación PAT.

Encapsulamiento PPP es un protocolo que trabaja en capa 2, o sea, capa de enlace de datos. Se encarga de encapsular las tramas que salen por la interfaz. La diferencia entre PPP y CHAP, es que por CHAP la información viaja cifrada.

- **Realizamos el encapsulamiento de MEDELLIN1 e ISP S0/1/1:**

MEDELLIN1>enable
MEDELLIN1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN1(config)#interface serial 0/1/1
MEDELLIN1(config-if)#ip address 209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#encapsulation ppp
MEDELLIN1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to down
MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#copy running-config startup-config
^
% Invalid input detected at '^' marker.
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#

```
MEDELLIN1>enable
MEDELLIN1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN1(config)#interface serial 0/1/1
MEDELLIN1(config-if)#ip address 209.17.220.2 255.255.255.252
MEDELLIN1(config-if)#encapsulation ppp
MEDELLIN1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to down

MEDELLIN1(config-if)#no shutdown
MEDELLIN1(config-if)#copy running-config startup-config
                    ^
% Invalid input detected at '^' marker.

MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

Figura 82 Encapsulamiento router MEDELLIN1

- **Realizamos la autenticación con PAP en MEDELLIN e ISP:**

MEDELLIN1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MEDELLIN1(config)#username BSAS password 1234

MEDELLIN1(config)#interface serial 0/1/1

MEDELLIN1(config-if)#ppp authentication pap

MEDELLIN1(config-if)#exit

MEDELLIN1(config)#exit

MEDELLIN1#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#

```
MEDELLIN1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN1(config)#username BSAS password 1234
MEDELLIN1(config)#interface serial 0/1/1
MEDELLIN1(config-if)#ppp authentication pap
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN1#
```

Figura 83 Autenticación PAP router MEDELLIN1

MEDELLIN1(config)#interface serial 0/1/1

MEDELLIN1(config-if)#encapsulation ppp

MEDELLIN1(config-if)#ppp authentication pap

MEDELLIN1(config-if)#ppp pap sent-username ISP password 1234

MEDELLIN1(config-if)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up

MEDELLIN1(config-if)#exit

MEDELLIN1(config)#exit

MEDELLIN1#

%SYS-5-CONFIG_I: ConFigurad from console by console

MEDELLIN1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#

```
MEDELLIN1(config)#interface serial 0/1/1
MEDELLIN1(config-if)#encapsulation ppp
MEDELLIN1(config-if)#ppp authentication pap
MEDELLIN1(config-if)#ppp pap sent-username ISP password 1234
MEDELLIN1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up

MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Figura 84 Envío datos autenticación router MEDELLIN1 a ISP

ISP#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

ISP(config)#username ISP password 1234

ISP(config)#interface serial 0/0/0

ISP(config-if)#encapsulation ppp

ISP(config-if)#ppp authentication pap

ISP(config-if)#ppp pap?

pap

ISP(config-if)#ppp pap ?

sent-username Set outbound PAP username

ISP(config-if)#ppp pap sent-isername ISP password 1234

^

% Invalid input detected at '^' marker.

ISP(config-if)#ppp pap sent-username ISP password 1234

PPP: Warning: You have chosen a username/password combination that is valid for CHAP. This is a potential security hole.

ISP(config-if)#ppp pap sent-isername BSAS password 1234

^

% Invalid input detected at '^' marker.

ISP(config-if)#ppp pap sent-username BSAS password 1234

ISP(config-if)#

```
ISP#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ISP(config)#username ISP password 1234
ISP(config)#interface serial 0/0/0
ISP(config-if)#encapsulation ppp
ISP(config-if)#ppp authentication pap
ISP(config-if)#ppp pap?
pap
ISP(config-if)#ppp pap ?
  sent-username  Set outbound PAP username
ISP(config-if)#ppp pap sent-isername ISP password 1234
                               ^
% Invalid input detected at '^' marker.

ISP(config-if)#ppp pap sent-username ISP password 1234
PPP: Warning:  You have chosen a username/password combination that
               is valid for CHAP.  This is a potential security hole.
ISP(config-if)#ppp pap sent-isername BSAS password 1234
                               ^
% Invalid input detected at '^' marker.

ISP(config-if)#ppp pap sent-username BSAS password 1234
ISP(config-if)#
```

Figura 85 Encapsulamiento router ISP

- Comprobamos realizando un PING desde MEDELLIN1 a ISP:

MEDELLIN1#ping 209.17.220.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 209.17.220.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/18/43 ms

MEDELLIN1#

```
MEDELLIN1#ping 209.17.220.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/18/43 ms

MEDELLIN1#
```

Figura 86 Ping desde router MEDELLIN1 a router ISP

b. El enlace Bogotá1 con ISP se debe configurar con autenticación CHAP.

BOGOTA1>enable

BOGOTA1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA1(config)#username BOGO password 1234

BOGOTA1(config)#interface serial 0/0/0

BOGOTA1(config-if)#ppp authentication chap

Must set encapsulation to PPP before using PPP subcommands

BOGOTA1(config-if)#exit

BOGOTA1(config)#exit

BOGOTA1#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

BOGOTA1#

```
BOGOTA1>enable
BOGOTA1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA1(config)#username BOGO password 1234
BOGOTA1(config)#interface serial 0/0/0
BOGOTA1(config-if)#ppp authentication chap
Must set encapsulation to PPP before using PPP subcommands
BOGOTA1(config-if)#exit
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#
```

Figura 87 Autenticación CHAP router BOGOTA1

- Hacemos PING de ISP a BOGOTA1:

ISP#ping 209.17.220.6

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 209.17.220.6, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/23/41 ms

ISP#

```
ISP#ping 209.17.220.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.17.220.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/23/41 ms

ISP#
```

Figura 88 PING de router ISP a BOGOTA1

1.1.6 Parte 6: Configuración de PAT.

a. En la topología, si se activa NAT en cada equipo de salida (Bogotá1 y Medellín1), los routers internos de una ciudad no podrán llegar hasta los routers internos en el otro extremo, sólo existirá comunicación hasta los routers Bogotá1, ISP y Medellín1.

Al activar NAT este un mecanismo utilizado por los routers para intercambiar paquetes entre dos redes que tienen distintas direcciones.

b. Después de verificar lo indicado en el paso anterior proceda a configurar el NAT en el router Medellín1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del router Medellín1, cómo diferente puerto.

```
MEDELLIN1(config)#ip nat inside source list 1 interface s0/0/0 overload
MEDELLIN1(config)#access-list 1 permit 172.29.4.0 0.0.3.255
MEDELLIN1(config)#interface serial 0/0/0
MEDELLIN1(config-if)#ip nat outside
MEDELLIN1(config-if)#interface serial 0/0/1
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#interface serial 0/1/0
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#interface serial 0/1/1
MEDELLIN1(config-if)#ip nat inside
MEDELLIN1(config-if)#exit
MEDELLIN1(config)#exit
MEDELLIN1#
%SYS-5-CONFIG_I: ConFigurad from console by console
```

MEDELLIN1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#copy run start

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN1#

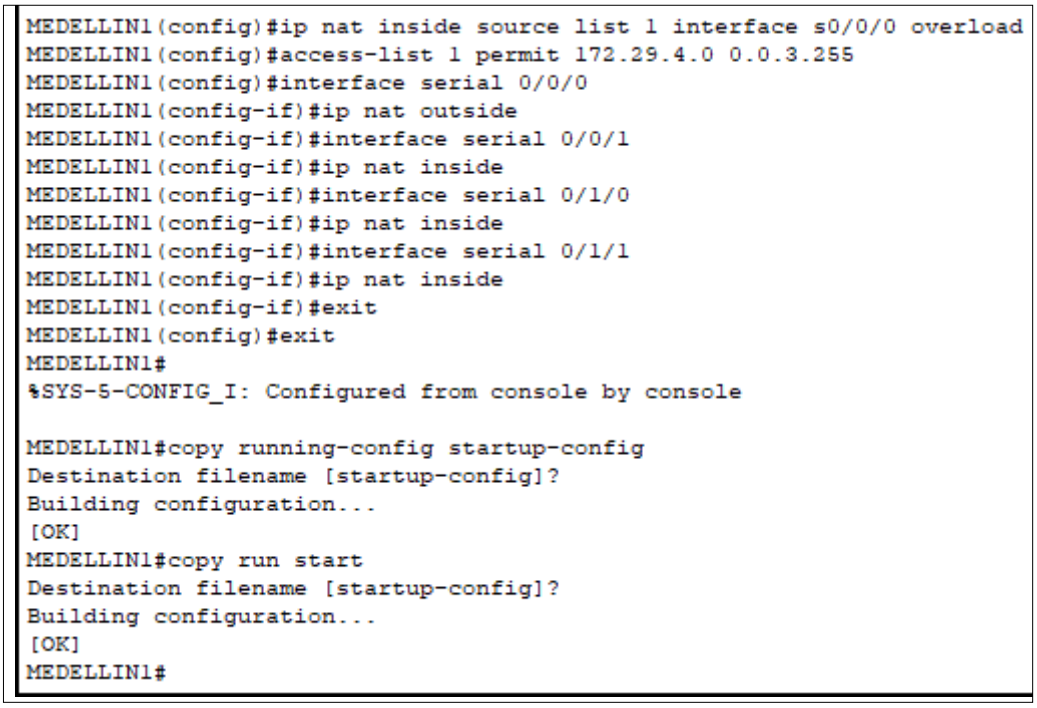


Figura 89 Configuración NAT router MEDELLIN1

c. Proceda a configurar el NAT en el router Bogotá1. Compruebe que la traducción de direcciones indique las interfaces de entrada y de salida. Al realizar una prueba de ping, la dirección debe ser traducida automáticamente a la dirección de la interfaz serial 0/1/0 del router Bogotá1, cómo diferente puerto.

```
BOGOTA1>enable
BOGOTA1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA1(config)#ip nat inside source list 1 interface s0/0/0 overload
BOGOTA1(config)#access-list 1 permit 172.29.0.0 0.0.3.255
BOGOTA1(config)#interface serial 0/0/0
BOGOTA1(config-if)#ip nat outside
BOGOTA1(config-if)#interface serial 0/0/1
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#interface serial 0/1/0
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#interface serial 0/1/1
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#exit
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#
```

```
BOGOTA1>enable
BOGOTA1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA1(config)#ip nat inside source list 1 interface s0/0/0 overload
BOGOTA1(config)#access-list 1 permit 172.29.0.0 0.0.3.255
BOGOTA1(config)#interface serial 0/0/0
BOGOTA1(config-if)#ip nat outside
BOGOTA1(config-if)#interface serial 0/0/1
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#interface serial 0/1/0
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#interface serial 0/1/1
BOGOTA1(config-if)#ip nat inside
BOGOTA1(config-if)#exit
BOGOTA1(config)#exit
BOGOTA1#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA1#
```

Figura 90 Configuración NAT router BOGOTA1

- **Verificamos haciendo PING desde la PC-150 HOST hasta el Router ISP. Exitoso:**

PC>ping 209.17.220.5

Pinging 209.17.220.5 with 32 bytes of data:
Reply from 209.17.220.5: bytes=32 time=23ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=2ms TTL=253
Reply from 209.17.220.5: bytes=32 time=25ms TTL=253
Ping statistics for 209.17.220.5:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 25ms, Average = 13ms
PC>

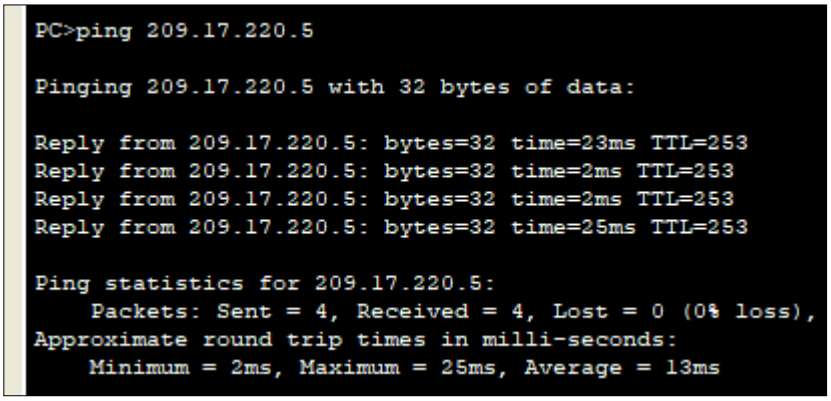


Figura 91 Ping desde PC-150 HOST al router ISP

1.1.7 Parte 7: Configuración del servicio DHCP.

a. Configurar la red Medellín2 y Medellín3 donde el router Medellín 2 debe ser el servidor DHCP para ambas redes Lan.

La configuración de un servidor de DHCP conlleva definir un conjunto de direcciones para asignar. Un servidor DHSC (DHCP Server) es un equipo en una red que está corriendo un servicio DHCP. Dicho servicio se mantiene a la escucha de peticiones broadcast DHCP. Cuando una de estas peticiones es escuchada, el servidor responde con una dirección IP y opcionalmente con información adicional.

*El comando **ip dhcp pool** NOMBRE crea un conjunto de ip's con el nombre elegido y provoca que el router entre en el modo de configuración de DHCP, que se identifica con la identificación **Router(dhcp-config)#.***

- **Configuramos DHCP en MEDELLIN2**

MEDELLIN2>ENABLE
MEDELLIN2#conFigura terminal

```
Enter configuration commands, one per line. End with CNTL/Z.
MEDELLIN2(config)#ip dhcp excluded-address 172.29.4.1 172.29.4.5
MEDELLIN2(config)#ip dhcp excluded-address 172.29.4.129 172.29.4.132
MEDELLIN2(config)#ip pool MEDELLIN
^
% Invalid input detected at '^' marker.
MEDELLIN2(config)#ip dhcp pool MEDELLIN
MEDELLIN2(dhcp-config)#network 172.29.4.1
% Incomplete command.
MEDELLIN2(dhcp-config)#network 172.29.4.1 255.255.255.128
MEDELLIN2(dhcp-config)#default-router 172.29.4.1
MEDELLIN2(dhcp-config)#dns-server 8.8.8.8
MEDELLIN2(dhcp-config)#exit
MEDELLIN2(config)#ip dhcp pool MEDELLIN1
MEDELLIN2(dhcp-config)#network 172.29.4.128 255.255.255.128
MEDELLIN2(dhcp-config)#default-router 172.29.4.129
MEDELLIN2(dhcp-config)#dns-server 8.8.8.8
MEDELLIN2(dhcp-config)#exit
MEDELLIN2(config)#
```

```
MEDELLIN2>ENABLE
MEDELLIN2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN2(config)#ip dhcp excluded-address 172.29.4.1 172.29.4.5
MEDELLIN2(config)#ip dhcp excluded-address 172.29.4.129 172.29.4.132
MEDELLIN2(config)#ip pool MEDELLIN
                    ^
% Invalid input detected at '^' marker.

MEDELLIN2(config)#ip dhcp pool MEDELLIN
MEDELLIN2(dhcp-config)#network 172.29.4.1
% Incomplete command.
MEDELLIN2(dhcp-config)#network 172.29.4.1 255.255.255.128
MEDELLIN2(dhcp-config)#default-router 172.29.4.1
MEDELLIN2(dhcp-config)#dns-server 8.8.8.8
MEDELLIN2(dhcp-config)#exit
MEDELLIN2(config)#ip dhcp pool MEDELLIN1
MEDELLIN2(dhcp-config)#network 172.29.4.128 255.255.255.128
MEDELLIN2(dhcp-config)#default-router 172.29.4.129
MEDELLIN2(dhcp-config)#dns-server 8.8.8.8
MEDELLIN2(dhcp-config)#exit
MEDELLIN2(config)#
```

Figura 92 Configurar DHCP en router MEDELLIN2

b. El router Medellín3 deberá habilitar el paso de los mensajes broadcast hacia la IP del router Medellín2.

- **Configuramos la IP en el PC-50 HOST que está directamente conectado al router de MEDELLIN2:**

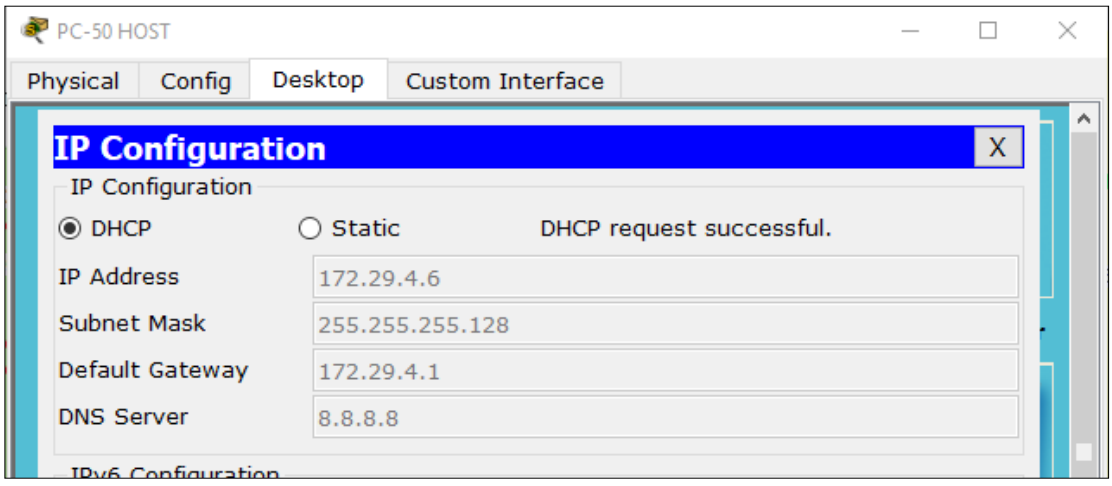


Figura 93 DHCP equipo PC-50 HOST

- Con la IP, la máscara y puerta de enlace, realizamos la configuración del redireccionamiento para que MEDELLIN2 se pueda conectar con DHCP:

MEDELLIN3(config)#int f0/0
MEDELLIN3(config-if)#ip helper-address 172.29.6.5
MEDELLIN3(config-if)#exit
MEDELLIN3(config)#exit
MEDELLIN3#
%SYS-5-CONFIG_I: ConFigurad from console by console
MEDELLIN3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN3#

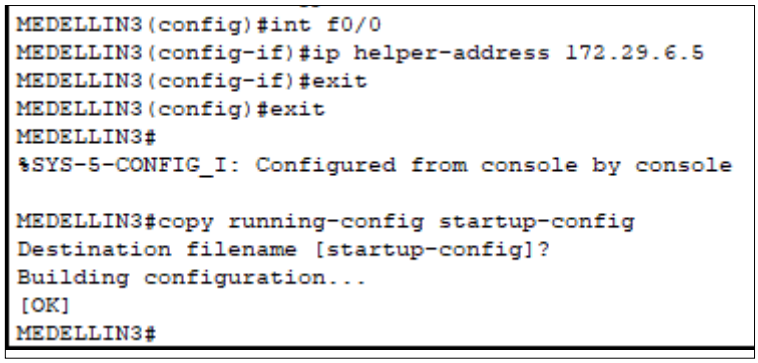


Figura 94 Redireccionamiento router MEDELLIN2

c. Configurar la red Bogotá2 y Bogotá3 donde el router Bogota2 debe ser el servidor DHCP para ambas redes Lan.

BOGOTA2>enable

BOGOTA2#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BOGOTA2(config)#ip dhcp excluded-address 172.29.1.1 172.29.1.5

BOGOTA2(config)#ip dhcp excluded-address 172.29.0.1 172.29.0.5

BOGOTA2(config)#ip dhcp pool BOGOTA

BOGOTA2(dhcp-config)#network 172.29.1.0 255.255.255.0

BOGOTA2(dhcp-config)#default-router 172.29.1.1

BOGOTA2(dhcp-config)#dns-server 8.8.8.8

BOGOTA2(dhcp-config)#ip dhcp pool BOGOTA1

BOGOTA2(dhcp-config)#network 172.29.0.0 255.255.255.0

BOGOTA2(dhcp-config)#default-router 172.29.0.1

BOGOTA2(dhcp-config)#dns-server 8.8.8.8

BOGOTA2(dhcp-config)#exit

BOGOTA2(config)#exit

BOGOTA2#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA2#

```
BOGOTA2>enable
BOGOTA2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA2(config)#ip dhcp excluded-address 172.29.1.1 172.29.1.5
BOGOTA2(config)#ip dhcp excluded-address 172.29.0.1 172.29.0.5
BOGOTA2(config)#ip dhcp pool BOGOTA
BOGOTA2(dhcp-config)#network 172.29.1.0 255.255.255.0
BOGOTA2(dhcp-config)#default-router 172.29.1.1
BOGOTA2(dhcp-config)#dns-server 8.8.8.8
BOGOTA2(dhcp-config)#ip dhcp pool BOGOTA1
BOGOTA2(dhcp-config)#network 172.29.0.0 255.255.255.0
BOGOTA2(dhcp-config)#default-router 172.29.0.1
BOGOTA2(dhcp-config)#dns-server 8.8.8.8
BOGOTA2(dhcp-config)#exit
BOGOTA2(config)#exit
BOGOTA2#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA2#
```

Figura 95 Servidor DHCP del router BOGOTA2

d. ConFigura el router Bogotá1 para que habilite el paso de los mensajes Broadcast hacia la IP del router Bogotá2.

- **En BOGOTA3 se solicita la conectividad por medio de la interface F0/0 a la PC-150 HOST:**

BOGOTA3(config)#interface f0/0
BOGOTA3(config-if)#ip helper-address 172.29.3.13
BOGOTA3(config-if)#exit
BOGOTA3(config)#exit
BOGOTA3#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA3#

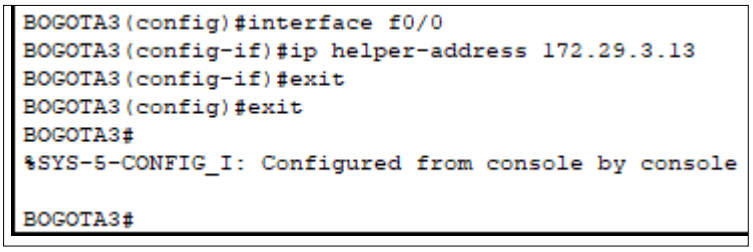


Figura 96 Paso de mensajes Broadcast hacia la IP del router BOGOTA2

- Configuramos la ip en el PC-150 HOST que está directamente conectado al router de BOGOTA3:

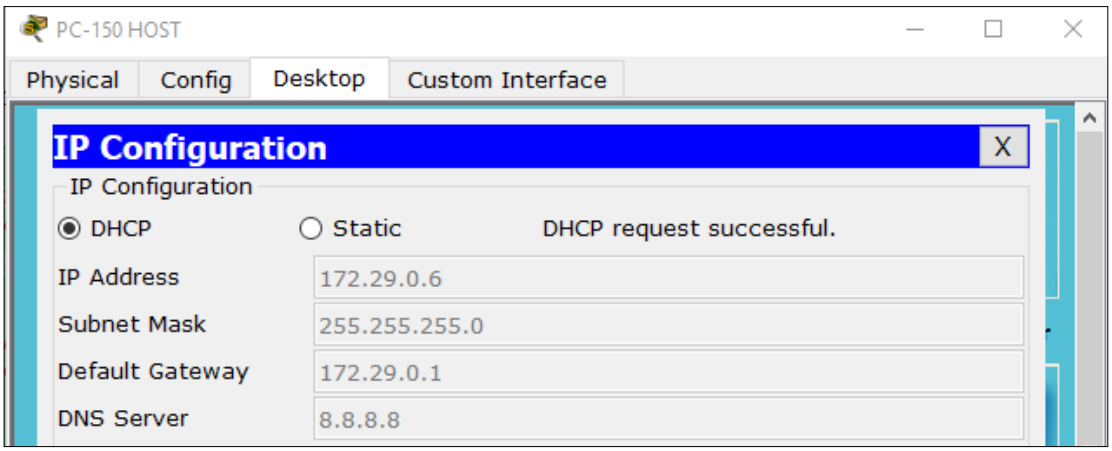


Figura 97 DHCP equipo PC-150 HOST

- Verificamos haciendo Ping desde la PC-150 HOST a la PC-200 HOST. Exitoso:

PC>ping 172.29.1.2

Pinging 172.29.1.2 with 32 bytes of data:

Request timed out.

Reply from 172.29.1.2: bytes=32 time=22ms TTL=126

Reply from 172.29.1.2: bytes=32 time=1ms TTL=126

Reply from 172.29.1.2: bytes=32 time=1ms TTL=126

Ping statistics for 172.29.1.2:

Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 22ms, Average = 8ms

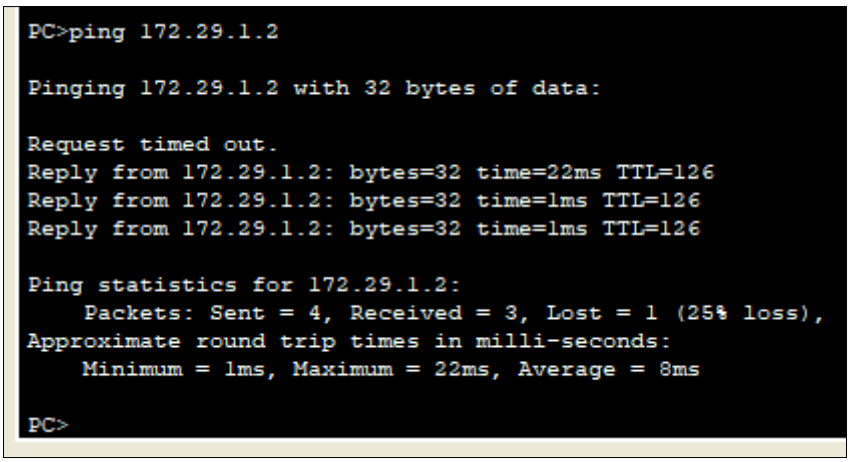


Figura 98 Ping entre equipos 150 HOST a 200 HOST

- Verificamos haciendo Ping desde la PC-200 HOST a la PC-150 HOST. Exitoso:

PC>ping 172.29.0.6

Pinging 172.29.0.6 with 32 bytes of data:

Reply from 172.29.0.6: bytes=32 time=1ms TTL=126

Reply from 172.29.0.6: bytes=32 time=29ms TTL=126

Reply from 172.29.0.6: bytes=32 time=2ms TTL=126

Reply from 172.29.0.6: bytes=32 time=1ms TTL=126

Ping statistics for 172.29.0.6:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 29ms, Average = 8ms

PC>

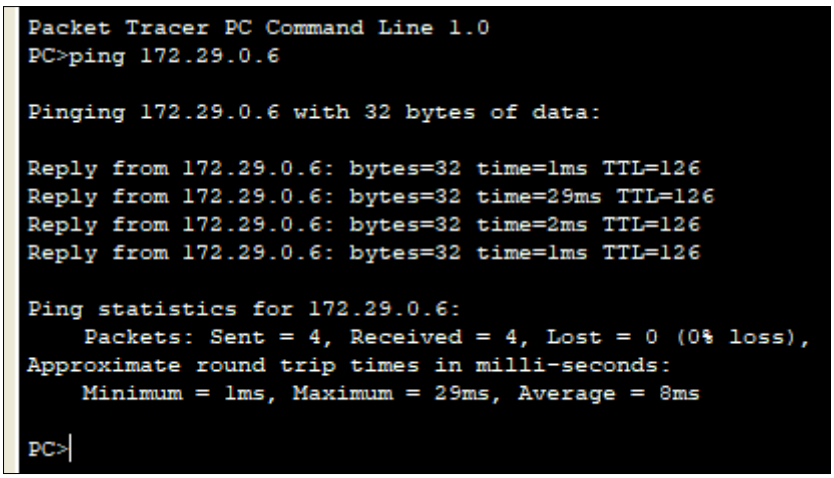
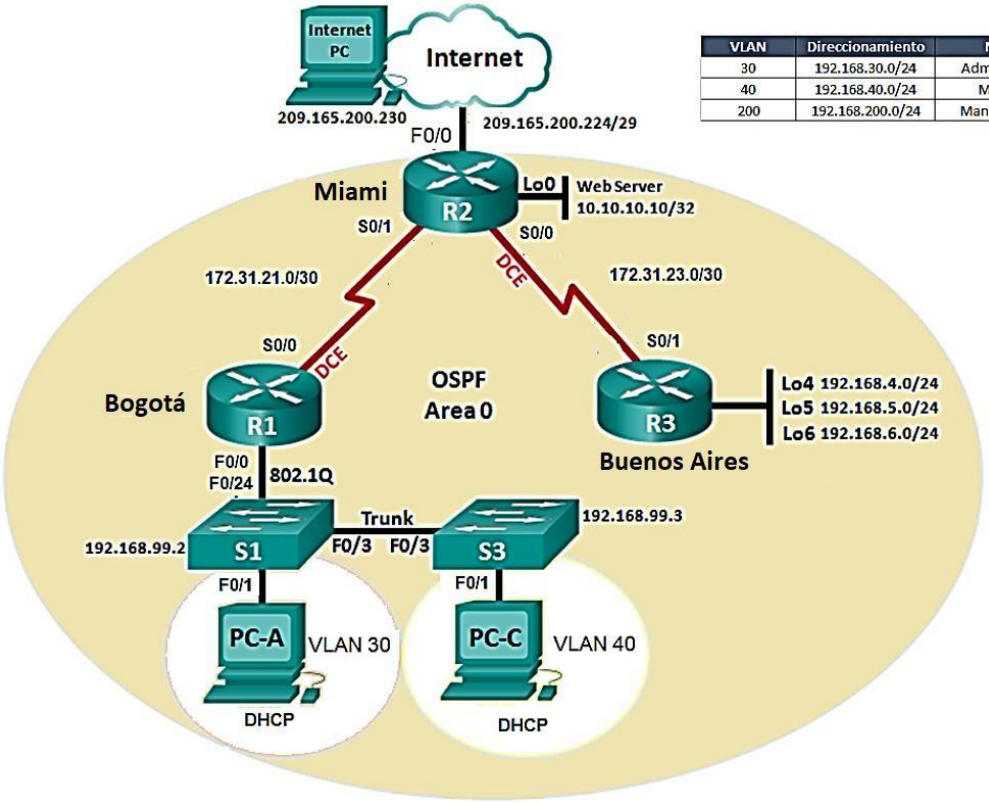


Figura 99 Ping entre equipos 200 HOST a 150 HOST

1.2 ESCENARIO 2



VLAN	Direccionamiento	Nombre
30	192.168.30.0/24	Administración
40	192.168.40.0/24	Mercadeo
200	192.168.200.0/24	Mantenimiento

Figura 100 Topología propuesta scenario 2

1.2.1 Configurar el direccionamiento IP

1. Configurar el direccionamiento IP acorde con la topología de red para cada uno de los dispositivos que forman parte del escenario.

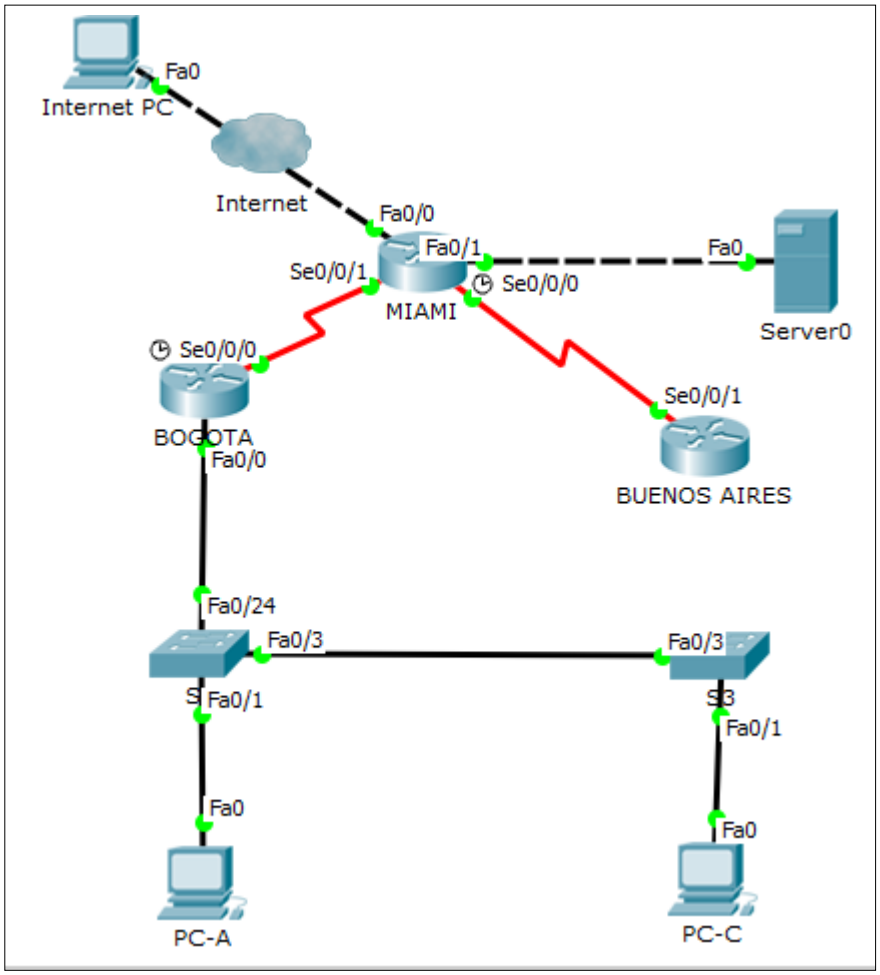


Figura 101 Topología desarrollada escenario 2

- **Configuramos el nombre del R2 con el Hostname de**

*Para el desarrollo de cada uno de los pasos, entramos al modo privilegiado colocando el comando **enable**, y presionamos enter.*

*Ya en el modo privilegiado, el prompt cambia a el nombre del router con un **#,** y colocamos el comando **conFigura terminal**, para entrar al modo de configuración global.*

*Utilizamos el comando **hostname** + el nombre, ya que es una escritura de la etiqueta que se da a un dispositivo para darle un nombre y distinguirlo de los otros dispositivos y presionamos enter y automaticamente cambia el promt con el nombre que le dimos.*

*Una vez ubicados en el modo configuración global, colocamos el comando interface **int** seguido de la interfaz, en este caso el serial y presionamos enter.*

*Ahora estamos dentro de un sub modo de configuracion global, donde cambia el prompt a **(config-if)#** y le damos la ip y mascara la interfaz mediante el comando ip address [ip] [mascara de subred], presionamos enter.*

*Finalmente, activamos las interfaces ya que vienen desactivadas por defecto mediante comando **no shutdown**, y asi es como asignamos la ip a una interfaz de un router cisco.*

Router>enable
Router#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname MIAMI
MIAMI(config)#

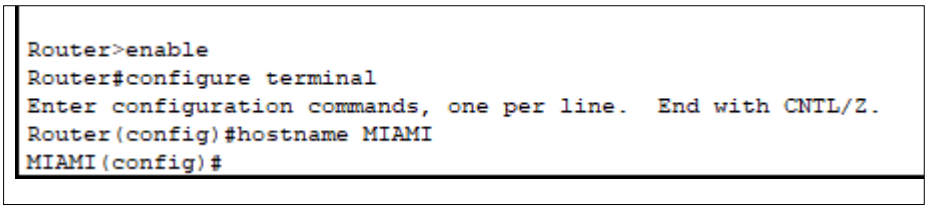


Figura 102 Hostname router MIAMI

- **Configuramos el router de MAIMI**

```
Router>enable
Router#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname MIAMI
MIAMI(config)#int s0/0/1
MIAMI(config-if)#ip add 172.31.21.2 255.255.255.252
MIAMI(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
MIAMI(config-if)#int s0/0/0
MIAMI(config-if)#ip add 172.31.23.1 255.255.255.252
MIAMI(config-if)#clock rate 128000
MIAMI(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
MIAMI(config-if)#int f0/0
MIAMI(config-if)#ip add 209.165.200.225 255.255.255.248
MIAMI(config-if)#no shutdown

MIAMI(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

MIAMI(config-if)#int f0/1
MIAMI(config-if)#ip add 10.10.10.1 255.255.255.0
MIAMI(config-if)#no shutdown

MIAMI(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
```

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

MIAMI(config-if)#exit
MIAMI(config)#ip route 0.0.0.0 0.0.0.0 f0/0
MIAMI(config)#exit
MIAMI#

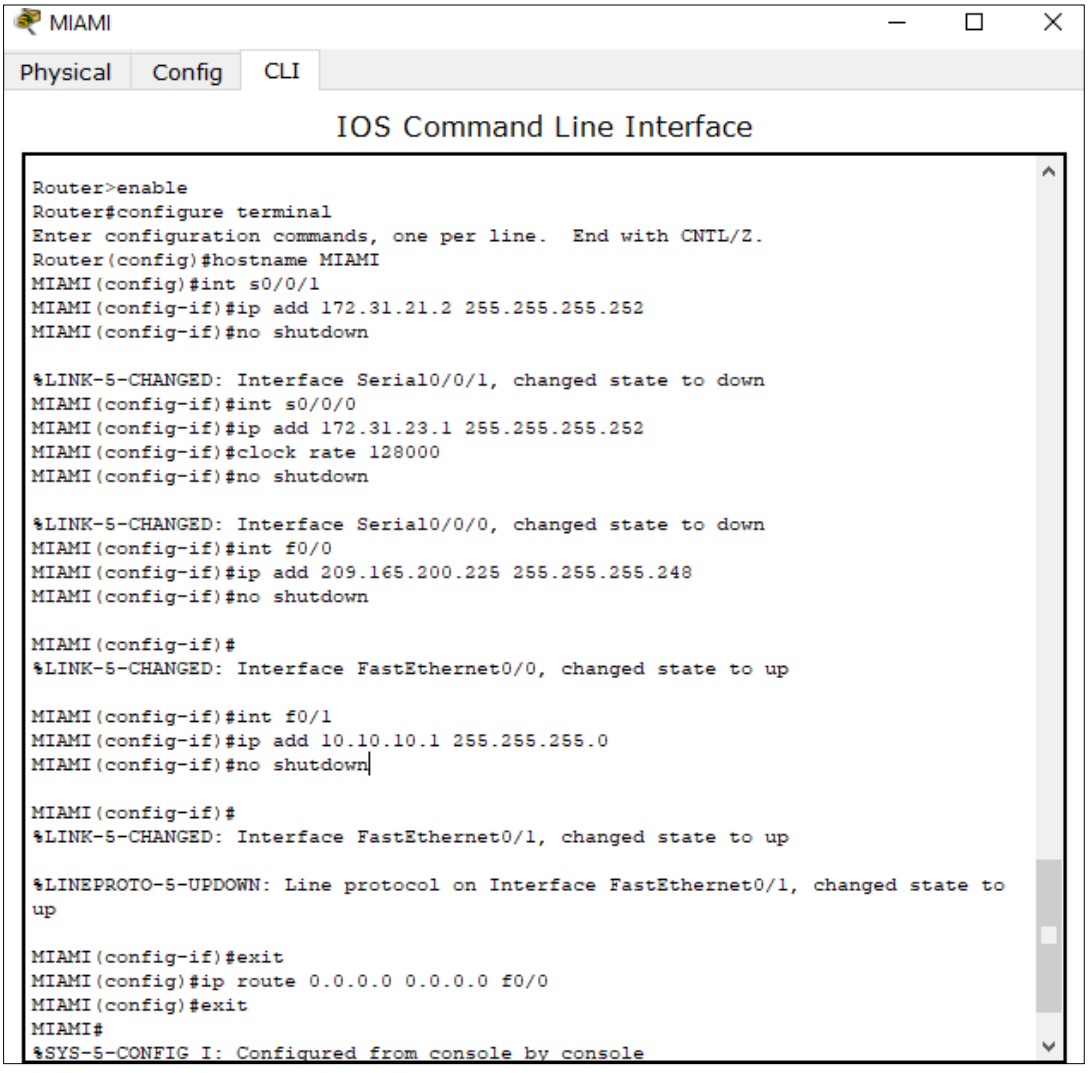


Figura 103 Configuración router MIAMI

- **Configuramos el nombre del R1 con el Hostname de BOGOTA:**

Router>enable
Router#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BOGOTA
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA#

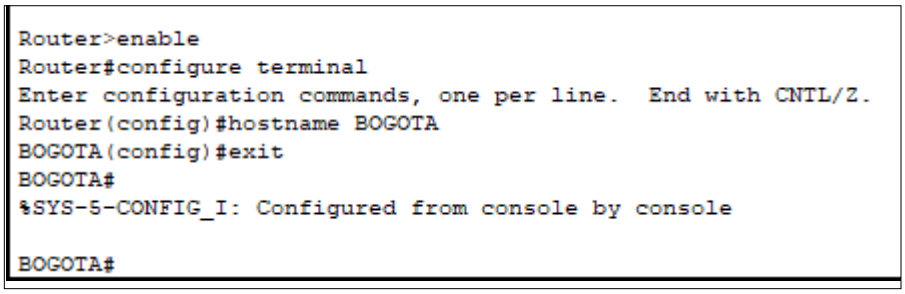


Figura 104 Hostname router BOGOTA

- **Configuramos el Router BOGOTA**

BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#int s0/0/0
BOGOTA(config-if)#ip add 172.31.21.1 255.255.255.252
BOGOTA(config-if)##clock rate 128000
^
% Invalid input detected at '^' marker.
BOGOTA(config-if)#clock rate 128000

BOGOTA(config-if)#no shutdown

BOGOTA(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

BOGOTA(config-if)#exit
BOGOTA(config)#exi
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
t
BOGOTA#

```
BOGOTA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA(config)#int s0/0/0
BOGOTA(config-if)#ip add 172.31.21.1 255.255.255.252
BOGOTA(config-if)##clock rate 128000
                  ^
% Invalid input detected at '^' marker.

BOGOTA(config-if)#clock rate 128000
BOGOTA(config-if)#no shutdown

BOGOTA(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

BOGOTA(config-if)#exit
BOGOTA(config)#exi
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
t
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
```

Figura 105 Configurar router BOGOTA

- **Configuramos el nombre del R3 con el Hostname de Buenos Aires:**

Router>enable
Router#conFigura termina
Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#conFigura terminal

^

% Invalid input detected at '^' marker.

Router(config)#hostname BUENOSAIRES

BUENOSAIRES(config)#exit

BUENOSAIRES#

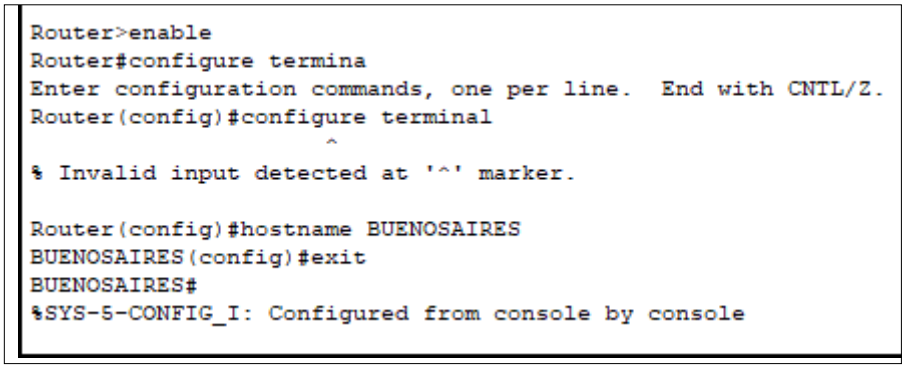


Figura 106 Hostname router Buenos Aires

- **Configuramos el router de Buenos Aires**

BUENOSAIRES#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BUENOSAIRES(config)#int s0/0/1

BUENOSAIRES(config-if)#ip add 172.31.23.2 255.255.252.252

Bad mask 0xFFFFFCFC for address 172.31.23.2

BUENOSAIRES(config-if)#no shutdown

BUENOSAIRES(config-if)#

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up

BUENOSAIRES(config-if)#

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

BUENOSAIRES(config-if)#int lo4

BUENOSAIRES(config-if)#
%LINK-5-CHANGED: Interface Loopback4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback4, changed state to up
BUENOSAIRES(config-if)#ip add 192.168.4.1 255.255.255.0
BUENOSAIRES(config-if)#no shutdown
BUENOSAIRES(config-if)#int lo5
BUENOSAIRES(config-if)#
%LINK-5-CHANGED: Interface Loopback5, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback5, changed state to up
BUENOSAIRES(config-if)#ip add 192.168.5.1 255.255.255.0
BUENOSAIRES(config-if)#no shutdown
BUENOSAIRES(config-if)#int lo6
BUENOSAIRES(config-if)#
%LINK-5-CHANGED: Interface Loopback6, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback6, changed state to up
BUENOSAIRES(config-if)#ip add 192.168.6.1 255.255.255.0
BUENOSAIRES(config-if)#exit
BUENOSAIRES(config)#ip route 0.0.0.0 0.0.0.0 s0/0/1
BUENOSAIRES(config)#exit
BUENOSAIRES#
%SYS-5-CONFIG_I: ConFigurad from console by console
BUENOSAIRES#

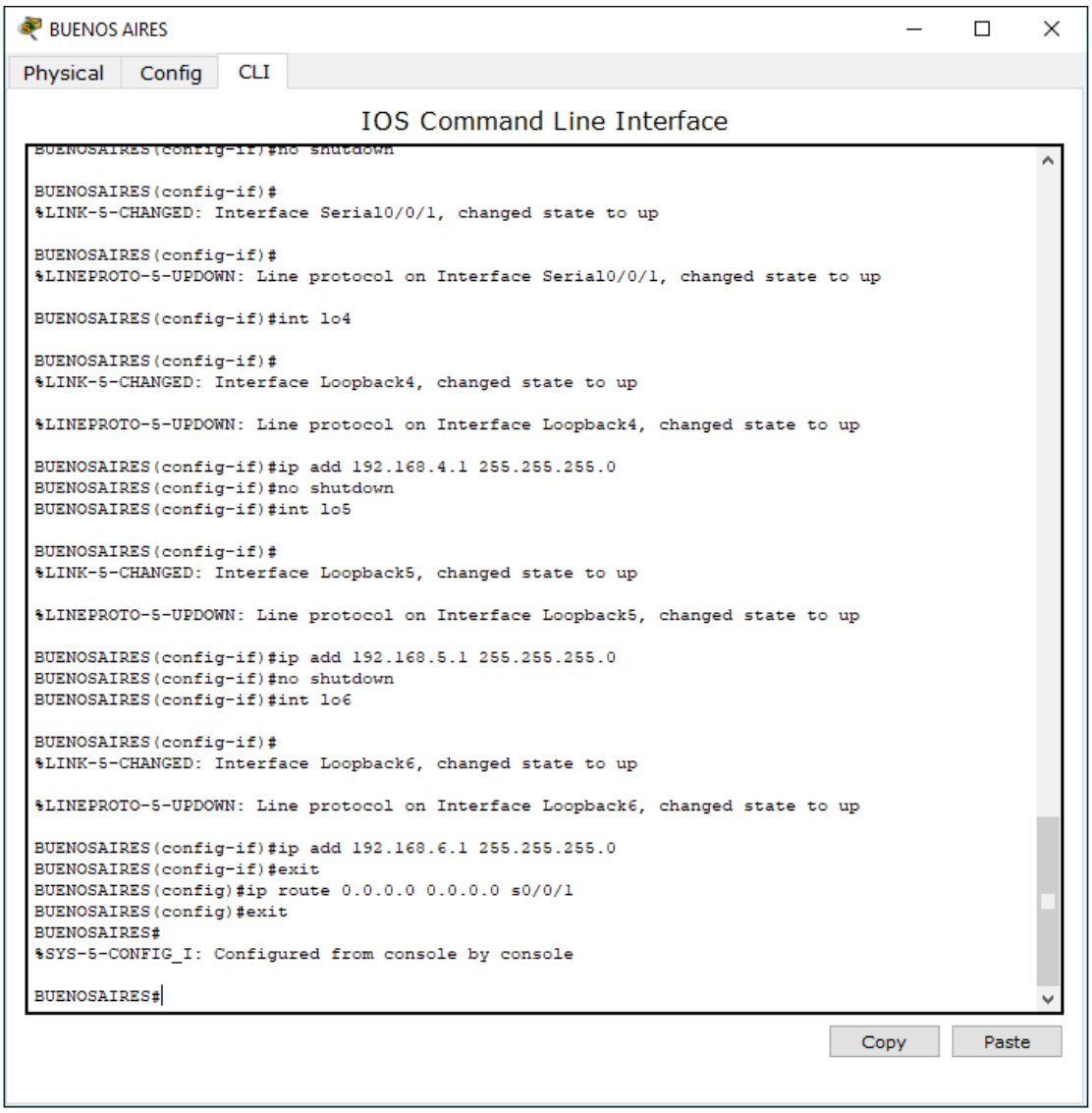


Figura 107 Configurar router BUENOSAIRES

- **Configuramos los Switches**
    - **Switch 1**

Switch>enable

Switch#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#no ip domain-lookup

Switch(config)#host S1

S1(config)#exit

S1#

%SYS-5-CONFIG_I: ConFigurad from console by console

S1#

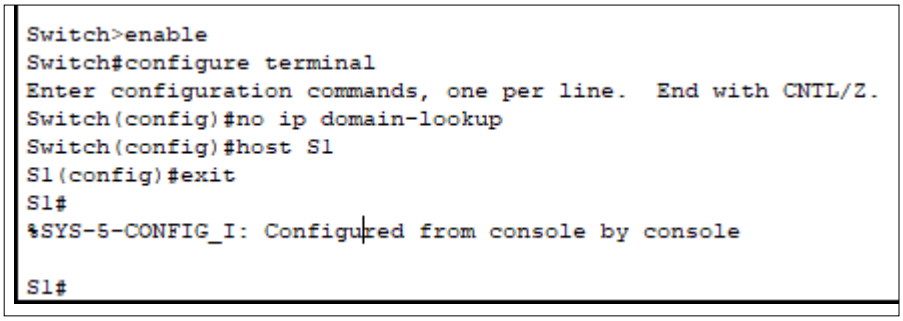


Figura 108 Configurar Switch 1

- **Switch 3**

Switch>enable

Switch#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#no ip domain-lookup

Switch(config)#hosname S3

^

% Invalid input detected at '^' marker.

Switch(config)#host S3

S3(config)#exit

S3#

%SYS-5-CONFIG_I: ConFigurad from console by console

S3#

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ip domain-lookup
Switch(config)#hosname S3
                  ^
% Invalid input detected at '^' marker.

Switch(config)#host S3
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

Figura 109 Configurar Switch 3

- **Configuramos la IP del internet PC**

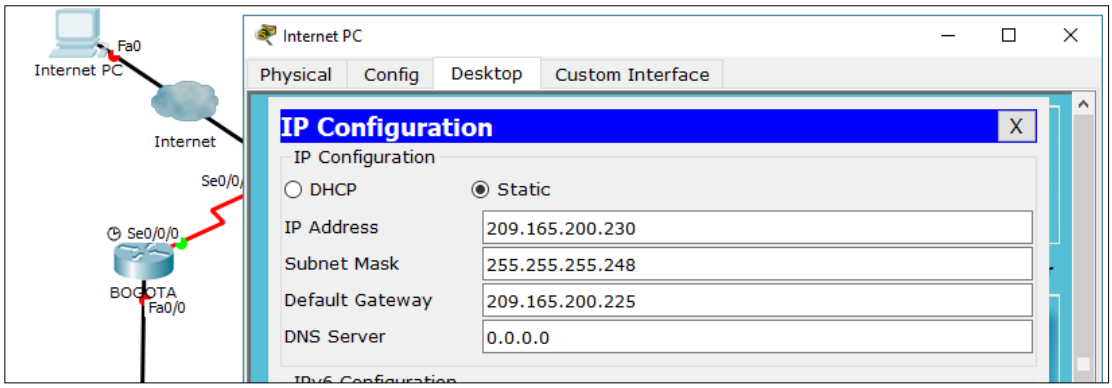


Figura 110 Configurar IP Internet PC

- **Configuramos el Servidor Web**

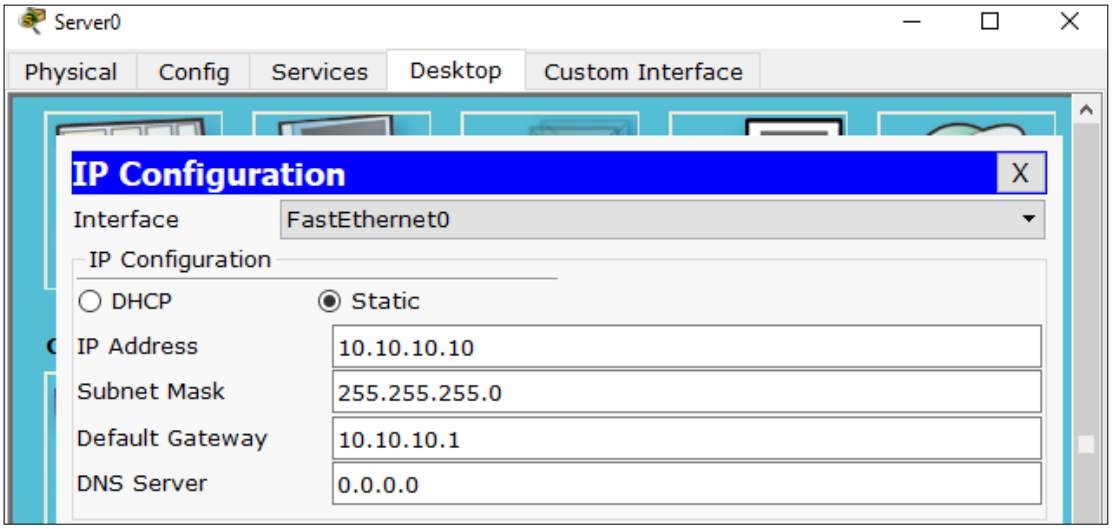


Figura 111 Configurar Servidor Web

1.2.2 Configurar protocolo de enrutamiento OSPFv2

2. Configurar el protocolo de enrutamiento OSPFv2 bajo los siguientes criterios:

Open Shortest Path First (OSPF), es un protocolo de red para encaminamiento jerárquico de pasarela interior o Interior Gateway Protocol (IGP), que se usa para calcular la ruta idónea entre dos dispositivos.

OSPFv2 area 0

Configuration Item or Task	Specification
Router ID R1	1.1.1.1
Router ID R2	5.5.5.5
Router ID R3	8.8.8.8
Configurar todas las interfaces LAN como pasivas	

Establecer el ancho de banda para enlaces seriales en	256 Kb/s
Ajustar el costo en la métrica de S0/0 a	9500

Verificar información de OSPF

- Visualizar tablas de enrutamiento y routers conectados por OSPFv2
- Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface
- Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.

A continuación, realizaremos la configuración de cada router y posteriormente visualizamos como queda la información:

- **Enrutamiento OSPFv2 para el R1 – BOGOTA**

```
BOGOTA>enable
BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#int f0/0.30
BOGOTA(config-subif)#
BOGOTA(config-subif)#encapsulation dot1q 30
BOGOTA(config-subif)#ip address 192.168.30.1 255.255.255.0
BOGOTA(config-subif)#exit
BOGOTA(config)#int f0/0.40
BOGOTA(config-subif)#encapsulation dot1q 40
BOGOTA(config-subif)#ip address 192.168.40.1 255.255.255.0
BOGOTA(config-subif)#exit
```

```
BOGOTA(config)#int f0/0.200
BOGOTA(config-subif)#encapsulation dot1q 200
BOGOTA(config-subif)#ip address 192.168.200.1 255.255.255.0
BOGOTA(config-subif)#router ospf 1
BOGOTA(config-router)#router-id 1.1.1.1
BOGOTA(config-router)#network 172.31.21.0 0.0.0.3 area 0
BOGOTA(config-router)#network 192.168.30.0 0.0.0.255 area 0
BOGOTA(config-router)#network 192.168.40.0 0.0.0.255 area 0
BOGOTA(config-router)#network 192.168.200.0 0.0.0.255 area 0
BOGOTA(config-router)#passive-interface f0/0.30
BOGOTA(config-router)#passive-interface f0/0.40
BOGOTA(config-router)#passive-interface f0/0.200
BOGOTA(config-router)#exit
BOGOTA(config)#int s0/0/0
BOGOTA(config-if)#bandwidth 256
BOGOTA(config-if)#ip ospf cost 9500
BOGOTA(config-if)#exit
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA#
```

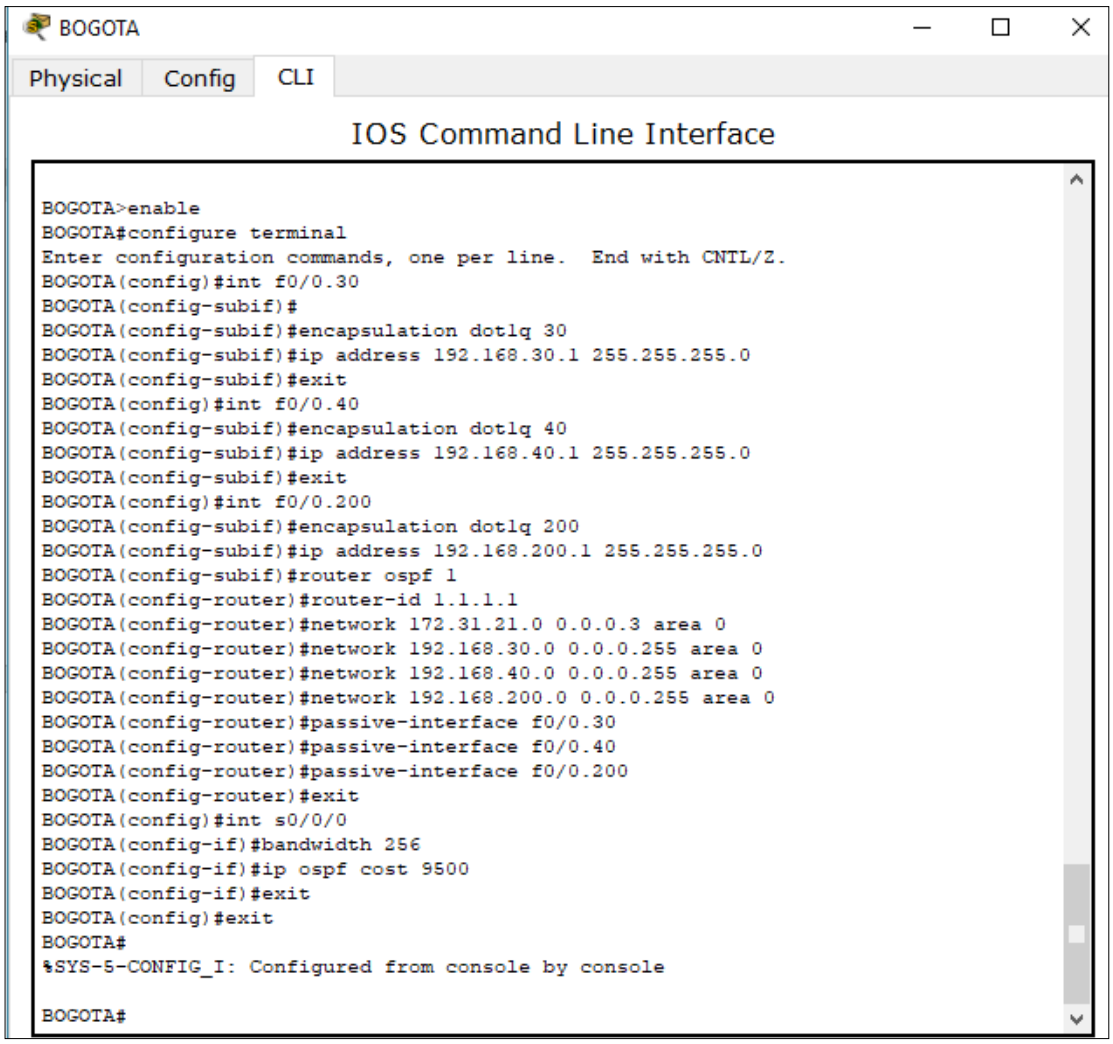


Figura 112 Enrutamiento OSPFv2 para el R1 – BOGOTA

- **Enrutamiento OSPFv2 para el R2 – MIAMI**

MIAMI>enable

MIAMI#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MIAMI(config)#router ospf 1

MIAMI(config-router)#router-id 5.5.5.5

MIAMI(config-router)#network 172.31.21.0 0.0.0.3 area 0

MIAMI(config-router)#

00:40:54: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/0/1 from LOADING to FULL, Loading Done

MIAMI(config-router)#network 172.31.23.0 0.0.0.3 area 0
MIAMI(config-router)#network 172.31.23.0 0.0.0.3 area 0
MIAMI(config-router)#network 172.31.21.0 0.0.0.3 area 0
MIAMI(config-router)#network 10.10.10.0 0.0.0.255 area 0
MIAMI(config-router)#passive-interface f0/0
MIAMI(config-router)#int s0/0/0
MIAMI(config-if)#bandwidth 256
MIAMI(config-if)#int s0/0/1
MIAMI(config-if)#bandwidth 256
MIAMI(config-if)#int s0/0/0
MIAMI(config-if)#ip ospf cost 9500
MIAMI(config-if)#exit
MIAMI(config)#exit
MIAMI#
%SYS-5-CONFIG_I: ConFigurad from console by console
MIAMI#

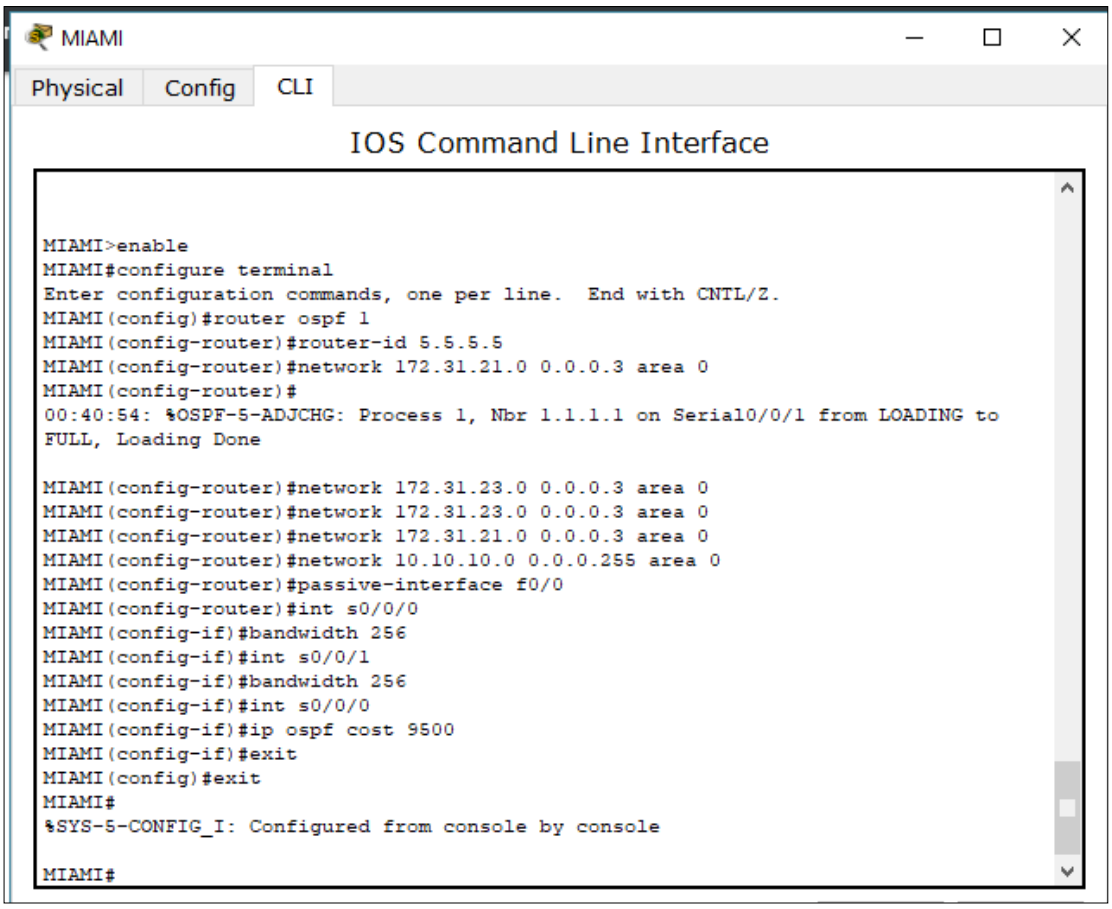


Figura 113 Enrutamiento OSPFv2 para el R2 – MIAMI

- **Enrutamiento OSPFv2 para el R3 – BUENOSAIRES**

BUENOSAIRES>enable

BUENOSAIRES#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

BUENOSAIRES(config)#router ospf 1

BUENOSAIRES(config-router)#router-id 8.8.8.8

BUENOSAIRES(config-router)#network 172.31.23.0 0.0.0.3 area 0

BUENOSAIRES(config-router)#network 192.168.4.0 0.0.0.255 area 0

BUENOSAIRES(config-router)#passive-interface lo4

BUENOSAIRES(config-router)#passive-interface lo5

BUENOSAIRES(config-router)#passive-interface lo6

BUENOSAIRES(config-router)#exit

BUENOSAIRES(config)#interface

% Incomplete command.

BUENOSAIRES(config)#interface s0/0/1

BUENOSAIRES(config-if)#bandwidth 256

BUENOSAIRES(config-if)#exit

BUENOSAIRES(config)#exit

BUENOSAIRES#

%SYS-5-CONFIG_I: ConFigurad from console by console

BUENOSAIRES#

```
BUENOSAIRES>enable
BUENOSAIRES#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BUENOSAIRES(config)#router ospf 1
BUENOSAIRES(config-router)#router-id 8.8.8.8
BUENOSAIRES(config-router)#network 172.31.23.0 0.0.0.3 area 0
BUENOSAIRES(config-router)#network 192.168.4.0 0.0.0.255 area 0
BUENOSAIRES(config-router)#passive-interface lo4
BUENOSAIRES(config-router)#passive-interface lo5
BUENOSAIRES(config-router)#passive-interface lo6
BUENOSAIRES(config-router)#exit
BUENOSAIRES(config)#interface
% Incomplete command.
BUENOSAIRES(config)#interface s0/0/1
BUENOSAIRES(config-if)#bandwidth 256
BUENOSAIRES(config-if)#exit
BUENOSAIRES(config)#exit
BUENOSAIRES#
%SYS-5-CONFIG_I: Configured from console by console

BUENOSAIRES#
```

Figura 114 Enrutamiento OSPFv2 para el R3 – BUENOSAIRES

- Visualizar tablas de enrutamiento y routers conectados por OSPFv2.

    - **Router 1 – Bogota**

BOGOTA>enable

BOGOTA#show ip ospf neighbor

Neighbor ID Pri State Dead Time Address Interface

5.5.5.5 0 FULL/ - 00:00:32 172.31.21.2 Serial0/0/0

BOGOTA#

```
BOGOTA>enable
BOGOTA#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
5.5.5.5           0   FULL/  -        00:00:32    172.31.21.2     Serial0/0/0
BOGOTA#
```

Figura 115 Enrutamiento router BOGOTA por OSPFv2.

BOGOTA#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

10.0.0.0/24 is subnetted, 1 subnets

O 10.10.10.0 [110/9501] via 172.31.21.2, 00:47:21, Serial0/0/0

172.31.0.0/30 is subnetted, 2 subnets

C 172.31.21.0 is directly connected, Serial0/0/0

O 172.31.23.0 [110/19000] via 172.31.21.2, 00:46:45, Serial0/0/0

BOGOTA#

```
BOGOTA#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
O       10.10.10.0 [110/9501] via 172.31.21.2, 00:47:21, Serial0/0/0
     172.31.0.0/30 is subnetted, 2 subnets
C       172.31.21.0 is directly connected, Serial0/0/0
O       172.31.23.0 [110/19000] via 172.31.21.2, 00:46:45, Serial0/0/0
BOGOTA#
```

Figura 116 Enrutamiento router BOGOTA

- **Router 2 – Miami.**

MIAMI>enable

MIAMI#show ip ospf neighbor

Neighbor ID Pri State Dead Time Address Interface

1.1.1.1 0 FULL/ - 00:00:30 172.31.21.1 Serial0/0/1

MIAMI#

```
MIAMI>enable
MIAMI#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
1.1.1.1           0   FULL/  -        00:00:30    172.31.21.1     Serial0/0/1
MIAMI#
```

Figura 117 Enrutamiento router MIAMI por OSPFv2

MIAMI#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

10.0.0.0/24 is subnetted, 1 subnets

C 10.10.10.0 is directly connected, FastEthernet0/1

172.31.0.0/30 is subnetted, 2 subnets

C 172.31.21.0 is directly connected, Serial0/0/1

C 172.31.23.0 is directly connected, Serial0/0/0

MIAMI#

```
MIAMI>enable
MIAMI#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, FastEthernet0/1
     172.31.0.0/30 is subnetted, 2 subnets
C       172.31.21.0 is directly connected, Serial0/0/1
C       172.31.23.0 is directly connected, Serial0/0/0
```

Figura 118 Enrutamiento router MIAMI

- **Router 3 – Buenos Aires.**

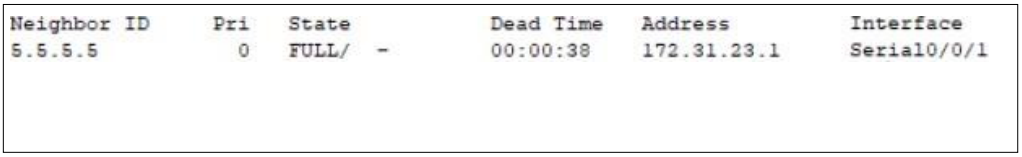
BUENOSAIRES>enable

BUENOSAIRES#show ip ospf neighbor

Neighbor ID Pri State Dead Time Address Interface

5.5.5.5 0 FULL/ - 00:00:38 172.31.23.1 Serial0/0/1

BUENOSAIRES#



Neighbor ID	Pri	State	Dead Time	Address	Interface
5.5.5.5	0	FULL/ -	00:00:38	172.31.23.1	Serial0/0/1

Figura 119 Enrutamiento router BUENOSAIRES por OSPFv2

BUENOSAIRES#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

C 192.168.4.0/24 is directly connected, Loopback4

C 192.168.5.0/24 is directly connected, Loopback5

C 192.168.6.0/24 is directly connected, Loopback6

BUENOSAIRES#

```
BUENOSAIRES$show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.4.0/24 is directly connected, Loopback4
C    192.168.5.0/24 is directly connected, Loopback5
C    192.168.6.0/24 is directly connected, Loopback6
BUENOSAIRES#
```

Figura 120 Enrutamiento router BUENOSAIRES

1.2.2 Visualizar lista resumida de interfaces por OSPF

- Visualizar lista resumida de interfaces por OSPF en donde se ilustre el costo de cada interface

  - **Router 1 – Bogota**

BOGOTA#show ip ospf interface

Serial0/0/0 is up, line protocol is up
Internet address is 172.31.21.1/30, Area
0
Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 9500
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
Timer intervals conFigurad, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:01
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1 , Adjacent neighbor count is 1

Adjacent with neighbor 5.5.5.5

Suppress hello for 0 neighbor(s)

BOGOTA#

```
BOGOTA#show ip ospf interface

Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.21.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 5.5.5.5
  Suppress hello for 0 neighbor(s)
BOGOTA#
```

Figura 121 Interfaces por OSPF router BOGOTA

- **Router 2 – Miami**

MIAMI#show ip ospf interface

Serial0/0/1 is up, line protocol is up

Internet address is 172.31.21.2/30, Area 0

Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 390

Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0

No designated router on this network

No backup designated router on this network

Timer intervals conFigurad, Hello 10, Dead 40, Wait 40, Retransmit 5

Hello due in 00:00:02

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 1.1.1.1
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Internet address is 172.31.23.1/30, Area
0
Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 9500
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
Timer intervals conFigurad, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:00
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Suppress hello for 0 neighbor(s)
FastEthernet0/1 is up, line protocol is up
Internet address is 10.10.10.1/24, Area 0
Process ID 1, Router ID 5.5.5.5, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 5.5.5.5, Interface address 10.10.10.1
No backup designated router on this network
Timer intervals conFigurad, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:05
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0

Suppress hello for 0 neighbor(s)

```
MIAMI#show ip ospf interface

Serial0/0/1 is up, line protocol is up
  Internet address is 172.31.21.2/30, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 390
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.31.23.1/30, Area 0
  Process ID 1, Router ID 5.5.5.5, Network Type POINT-TO-POINT, Cost: 9500
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
```

Figura 122 Interfaces por OSPF router MIAMI

- **Router 3 – BuenosAres**

BUENOSAIRES#show ip ospf interface

Loopback4 is up, line protocol is up

Internet address is 192.168.4.1/24, Area 0

Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1

Loopback interface is treated as a stub Host

```
BUENOSAIRES#show ip ospf interface

Loopback4 is up, line protocol is up
  Internet address is 192.168.4.1/24, Area 0
  Process ID 1, Router ID 8.8.8.8, Network Type LOOPBACK, Cost: 1
  Loopback interface is treated as a stub Host
```

Figura 123 Interfaces por OSPF router BUENOSAIRES

- Visualizar el OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configuradas en cada router.

    - **Router 1 – Bogota**

BOGOTA#show ip protocols

Routing Protocol is "ospf 1"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 1.1.1.1
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
172.31.21.0 0.0.0.3 area 0
192.168.30.0 0.0.0.255 area 0
192.168.40.0 0.0.0.255 area 0
192.168.200.0 0.0.0.255 area 0
Passive Interface(s):
FastEthernet0/0.30
FastEthernet0/0.40
FastEthernet0/0.200
Routing Information Sources:
Gateway Distance Last Update
1.1.1.1 110 00:27:40
5.5.5.5 110 00:26:43
Distance: (default is 110)
BOGOTA#

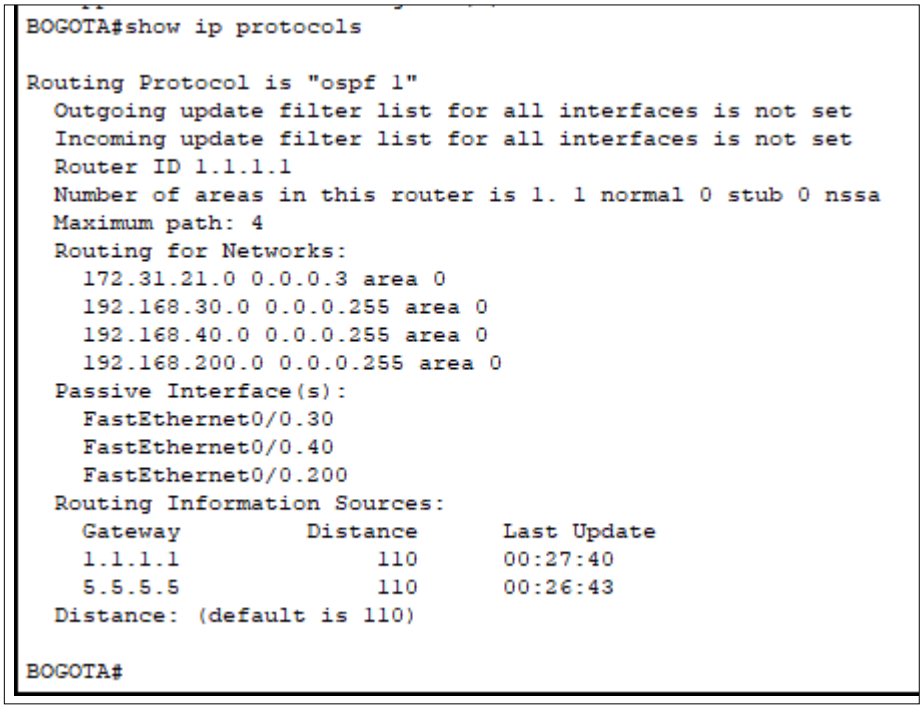


Figura 124 Protocolos router BOGOTA

- **Router 2 – Miami**

MIAMI#show ip protocols

Routing Protocol is "ospf 1"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 5.5.5.5
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
172.31.21.0 0.0.0.3 area 0
172.31.23.0 0.0.0.3 area 0
10.10.10.0 0.0.0.255 area 0
Passive Interface(s):

FastEthernet0/0

Routing Information Sources:

Gateway Distance Last Update

1.1.1.1 110 00:28:20

5.5.5.5 110 00:27:22

Distance: (default is 110)

MIAMI#

```
MIAMI#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 5.5.5.5
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.21.0 0.0.0.3 area 0
    172.31.23.0 0.0.0.3 area 0
    10.10.10.0 0.0.0.255 area 0
  Passive Interface(s):
    FastEthernet0/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    1.1.1.1              110      00:28:20
    5.5.5.5              110      00:27:22
  Distance: (default is 110)

MIAMI#
```

Figura 125 Protocolos router MIAMI

- **Router 3 – BuenosAires**

BUENOSAIRES#show ip protocols

Routing Protocol is "ospf 1"

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Router ID 8.8.8.8

Number of areas in this router is 1. 1 normal 0 stub 0 nssa

Maximum path: 4

Routing for Networks:

172.31.23.0 0.0.0.3 area 0

192.168.4.0 0.0.0.255 area 0

Passive Interface(s):

Loopback4

Loopback5

Loopback6

Routing Information Sources:

Gateway Distance Last Update

8.8.8.8 110 00:27:34

Distance: (default is 110)

BUENOSAIRES#

```
BUENOSAIRES#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 8.8.8.8
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.31.23.0 0.0.0.3 area 0
    192.168.4.0 0.0.0.255 area 0
  Passive Interface(s):
    Loopback4
    Loopback5
    Loopback6
  Routing Information Sources:
    Gateway         Distance      Last Update
    8.8.8.8              110      00:27:34
  Distance: (default is 110)

BUENOSAIRES#
```

Figura 126 Protocolos router BUENOSAIRES

1.2.3 Configruar VLANs

3. Configurar VLANs, Puertos troncales, puertos de acceso, encapsulamiento, Inter-VLAN Routing y Seguridad en los Switches acorde a la topología de red establecida.

La VLAN, LAN (red de área local virtual) nos permite crear redes lógicas independientes dentro de una misma red física.

- **Activamos el Puerto del Router 1 – Bogota para FastEthernet0/0**

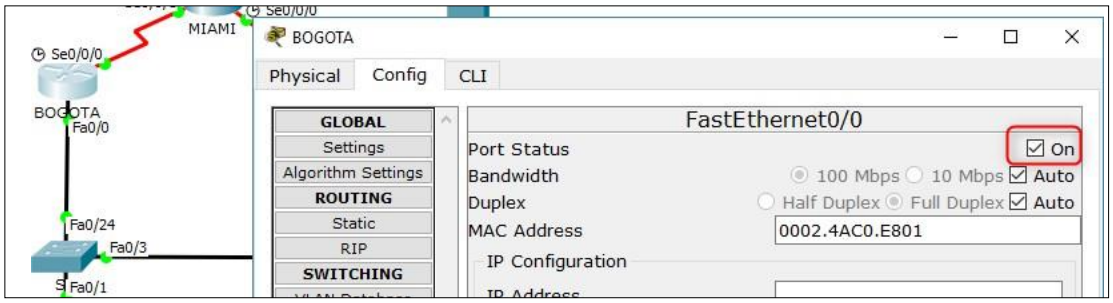


Figura 127 Activar puerto router 1 BOGOTA

- **Switch 1 - S1**

  - **Configuramos la VLANs para el Switch 1 S1**

S1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#no ip domain-lookup
S1(config)#vlan 30

S1(config-vlan)#name Administracion

S1(config-vlan)#vlan 40

S1(config-vlan)#name Mercadeo

S1(config-vlan)#vlan 200

S1(config-vlan)#name Mantenimiento

S1(config-vlan)#int vlan 200

S1(config-if)#ip address 192.168.200.2 255.255.255.0

S1(config-if)#no shutdown

S1(config-if)#exit

S1(config)#exit

S1#

%SYS-5-CONFIG_I: ConFigurad from console by console

S1#

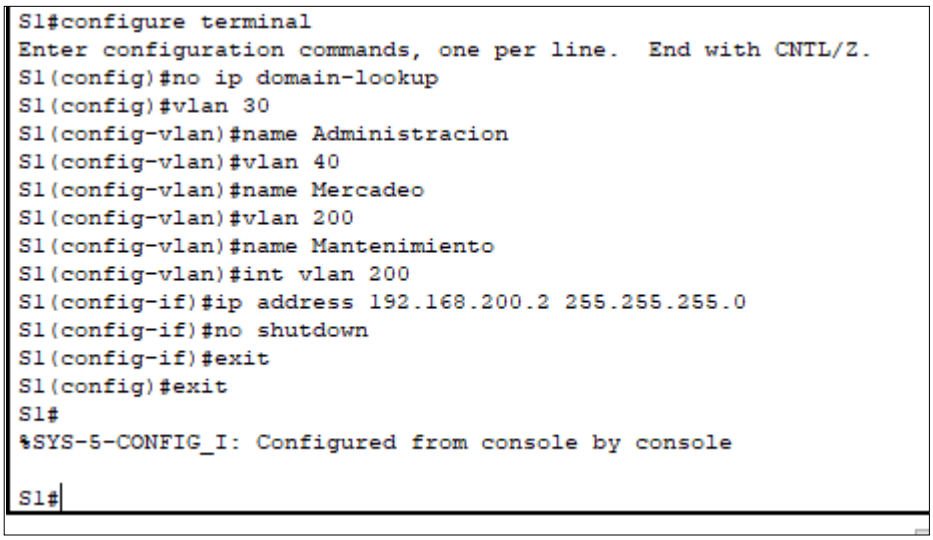


Figura 128 VLANs Switch 1

- **Puertos troncales y puertos de acceso:**

Un enlace troncal de VLAN entre dos switches transporta el tráfico para todas las VLAN. Para habilitar los enlaces troncales, hay que configurar los puertos en cualquier extremo del enlace físico con conjuntos de comandos

paralelos. Para configurar un puerto de switch en un extremo de un enlace troncal, utilizamos el comando ***switchport mode trunk.***

```
S1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#ip default-gateway 192.168.200.1
S1(config)#interface f0/3
S1(config-if)#switchport mode trunk
S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3,
changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3,
changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed
state to up
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#interface f0/24
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#interface range fa0/1-2, fa0/4-24, GigabitEthernet0/1-2
S1(config-if-range)#switchport mode access
S1(config-if-range)#interface fa0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S1(config-if)#interface range fa0/2, fa0/4-23, GigabitEthernet0/1-2
S1(config-if-range)#shutdown
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to
administratively down
```

%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to administratively down
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down
S1(config-if-range)#exit
S1(config)#exit
S1#
%SYS-5-CONFIG_I: ConFigurad from console by console

S1#

```
S1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#ip default-gateway 192.168.200.1
S1(config)#interface f0/3
S1(config-if)#switchport mode trunk

S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to
down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to
up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed state to up

S1(config-if)#switchport trunk native vlan 1
S1(config-if)#interface f0/24
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1
S1(config-if)#interface range fa0/1-2, fa0/4-24, GigabitEthernet0/1-2
S1(config-if-range)#switchport mode access
S1(config-if-range)#interface fa0/1
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 30
S1(config-if)#interface range fa0/2, fa0/4-23, GigabitEthernet0/1-2
S1(config-if-range)#shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down
```

Figura 129 Puertos troncales y puertos de acceso S1

- **Configuración de seguridad**

Permite incrementar la seguridad en una red LAN sobre los puertos en los switches en la capa de acceso y de esta manera permitir que a cada puerto se conecte sólo de forma autorizada.

S1>enable
S1#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#enable secret class

```
S1(config)#ine con 0
^
% Invalid input detected at '^' marker.
S1(config)#line con 0
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#line vty 0 4
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#
S1(config-line)#service password-encryption
S1(config)#banner motd "Prohibido el acceso"
S1(config)#no ip domain-lookup
S1(config)#exit
S1#
%SYS-5-CONFIG_I: ConFigurad from console by console

S1#
```

```
S1>enable
S1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#enable secret class
S1(config)#ine con 0
             ^
% Invalid input detected at '^' marker.

S1(config)#line con 0
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#line vty 0 4
S1(config-line)#pass cisco
S1(config-line)#login
S1(config-line)#
S1(config-line)#service password-encryption
S1(config)#banner motd "Prohibido el acceso"
S1(config)#no ip domain-lookup
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console

S1#
```

Figura 130 Configurar seguridad S1

- **Switch 3 – S3**

    - **Configuramos la VLANs**

S3>enable

S3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

S3(config)#hostname S3

S3(config)#no ip domain-lookup

S3(config)#vlan 30

S3(config-vlan)#

S3(config-vlan)#name Administracion

S3(config-vlan)#vlan 40

S3(config-vlan)#name Mercadeo

S3(config-vlan)#vlan 200

```
S3(config-vlan)#name Mantenimiento
S3(config-vlan)#exit
S3(config)#nt vlan 200
^
% Invalid input detected at '^' marker.
S3(config)#int vlan 200
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan200, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan200, changed
state to up

S3(config-if)#ip address 192.168.200.2 255.255.255.0
S3(config-if)#no shutdown
S3(config-if)#exit
S3(config)#exit
S3#
%SYS-5-CONFIG_I: ConFigurad from console by console

S3#
```

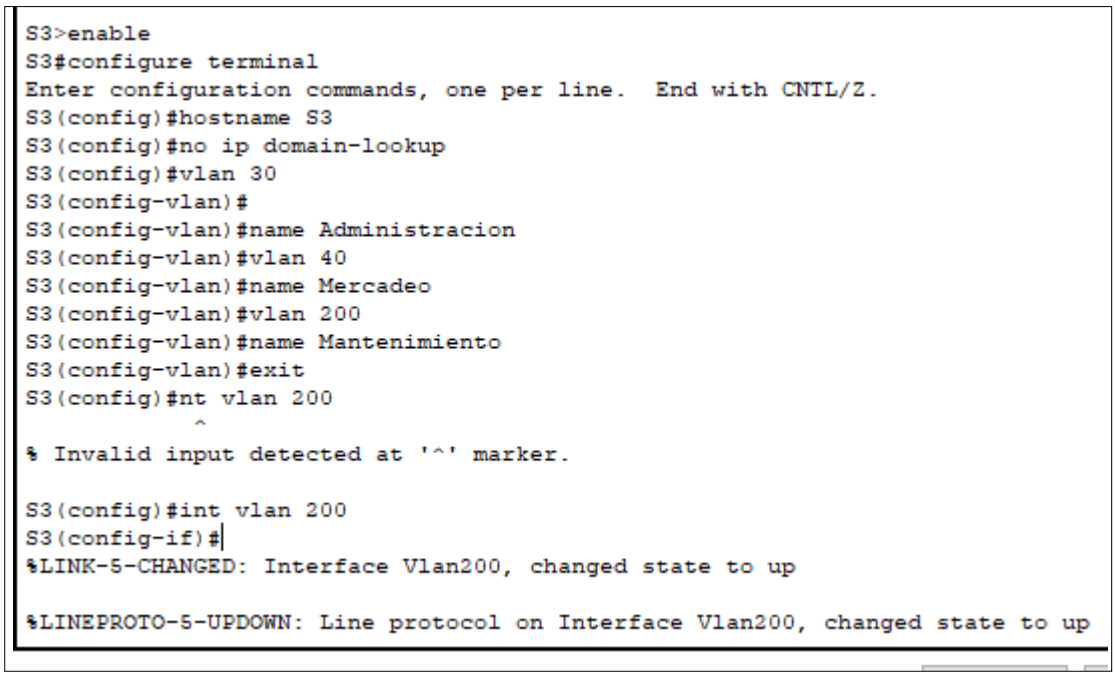


Figura 131 VLANs Switch 3

- **Puertos troncales y puertos de acceso**

S3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

S3(config)#ip default-gateway 192.168.200.1

S3(config)#interface f0/3

S3(config-if)#switchport mode trunk

S3(config-if)#switchport trunk native vlan 1

S3(config-if)#nterface f0/24

^

% Invalid input detected at '^' marker.

S3(config-if)#interface f0/24

S3(config-if)#exit

S3(config)#ip default-gateway 192.168.200.1

S3(config)#interface f0/3

S3(config-if)#switchport mode trunk

```
S3(config-if)#switchport trunk native vlan 1
S3(config-if)#interface range fa0/1-2, fa0/4-24, GigabitEthernet0/1-2
S3(config-if-range)#switchport mode access
S3(config-if-range)#interface fa0/1
S3(config-if)#switchport mode access
S3(config-if)#switchport access vlan 40
S3(config-if)#interface range fa0/2, fa0/4-24, GigabitEthernet0/1-2
S3(config-if-range)#shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/10, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/11, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/12, changed state to
administratively down
%LINK-5-CHANGED: Interface FastEthernet0/13, changed state to
administratively down
```

%LINK-5-CHANGED: Interface FastEthernet0/14, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/15, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/16, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/17, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/18, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/19, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/20, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to administratively down
%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to administratively down
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down

S3(config-if-range)#

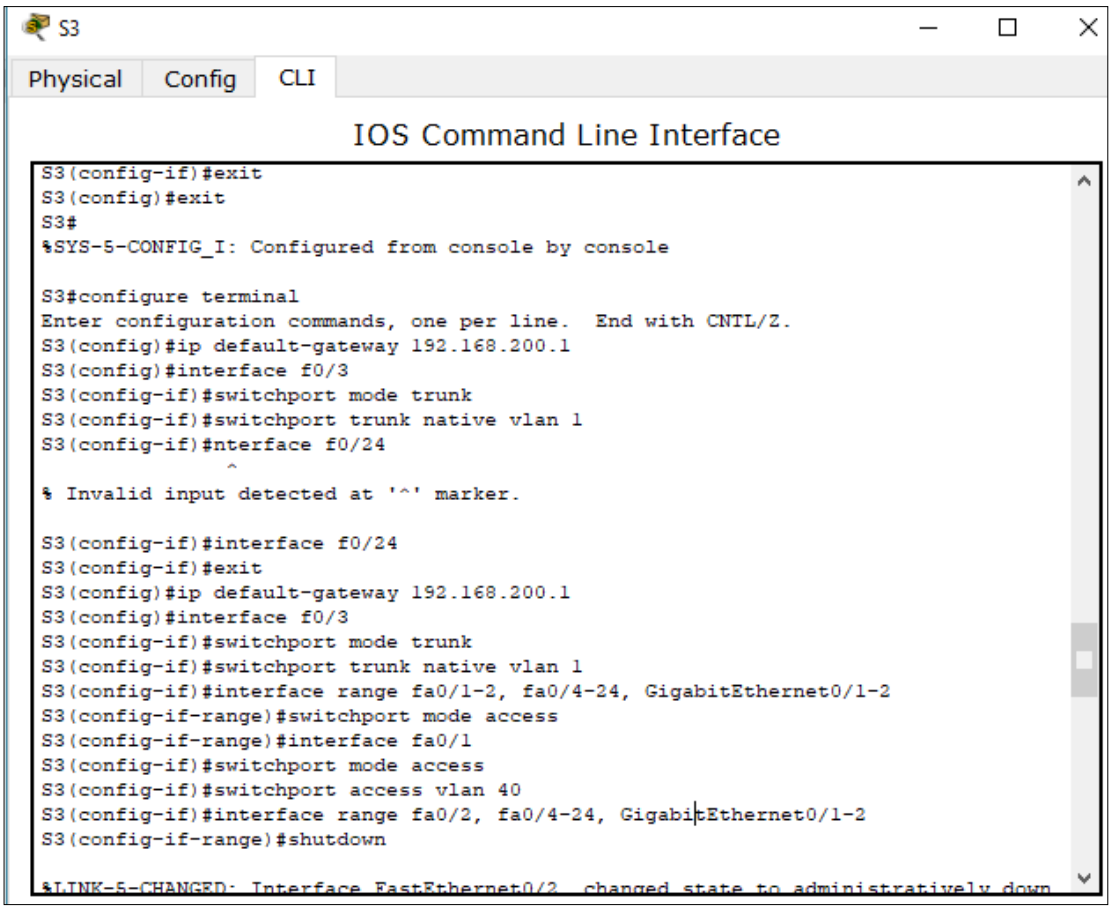


Figura 132 Puertos troncales y puertos de acceso S3

- **Configuración de seguridad**

S3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

S3(config)#enable secret class

S3(config)#line con 0

S3(config-line)#pass cisco

S3(config-line)#login

S3(config-line)#line vty 0 4

S3(config-line)#pass cisco

S3(config-line)#login

S3(config-line)#service password-encryption

S3(config)#banner motd "Prohibido el acceso"

S3(config)#no ip domain-lookup

S3(config)#exit

S3#

%SYS-5-CONFIG_I: ConFigurad from console by console

S3#

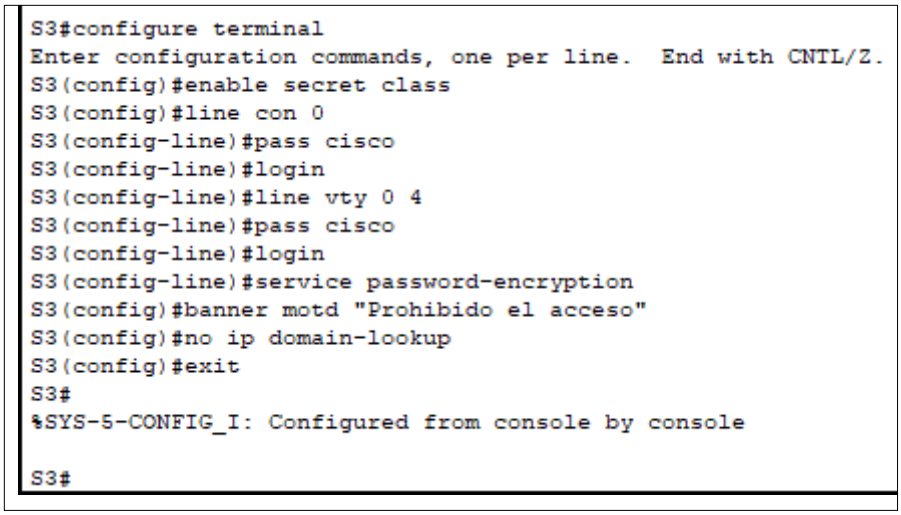


Figura 133 Configurar seguridad S3

1.2.4 Deshabilitar DNS Lookup

4. En el Switch 3 deshabilitar DNS lookup

Lo mejor es desactivar en DNS para evitar asi que si un comando se escribe de forma errónea, el enrutador supondrá que el nombre debe ser resuelto mediante una búsqueda de DNS y esto bloqueará el teclado y generará demoras al ingresar comandos de configuración. Entonces, si no hay ningún servidor DNS disponible, la mejor opción es apagar por completo las búsquedas de DNS y en el enrutamiento se hará búsquedas de DNS por defecto. Para esto introducimos el comando ***"no ip domain-lookup".***

S3#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

S3(config)#no ip domain-lookup

S3(config)#exit

S3#

%SYS-5-CONFIG_I: ConFigurad from console by console

S3#

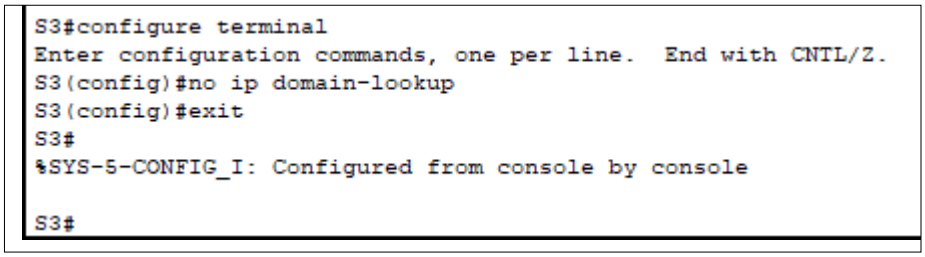


Figura 134 Deshabilitar DNS lookup S3

1.2.5 Asignar direcciones IP a los Switches

5. Asignar direcciones IP a los Switches acorde a los lineamientos.

- **Switch 1 S1**

S1>enable

S1#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

S1(config)#int vlan 200

S1(config-if)#ip address 192.168.200.2 255.255.255.0

S1(config-if)#no shutdown

S1(config-if)#exit

S1(config)#ip default-gateway 192.168.200.1

S1(config)#exit

S1#

%SYS-5-CONFIG_I: ConFigurad from console by console

```
S1>enable
S1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#int vlan 200
S1(config-if)#ip address 192.168.200.2 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 192.168.200.1
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console
```

Figura 135 Asignar direcciones IP S1

- **Switch 3 S3**

S3(config-if-range)#exit

S3(config)#int vlan 200

S3(config-if)#ip address 192.168.200.3 255.255.255.0

S3(config-if)#no shutdown

S3(config-if)#exit

S3(config)#ip default-gateway 192.168.200.1

S3(config)#exit

S3#

%SYS-5-CONFIG_I: ConFigurad from console by console

S3#

```
S3(config-if-range)#exit
S3(config)#int vlan 200
S3(config-if)#ip address 192.168.200.3 255.255.255.0
S3(config-if)#no shutdown
S3(config-if)#exit
S3(config)#ip default-gateway 192.168.200.1
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

Figura 136 Asignar direcciones IP S3

1.2.6 Desactivar interfaces

6. Desactivar todas las interfaces que no sean utilizadas en el esquema de red.

- **Switch 1 S1**

S1(config-if)#interface range fa0/2, fa0/4-23, GigabitEthernet0/1-2
S1(config-if-range)#shutdown
S1(config-if-range)#exit
S1(config)#exit
S1#
%SYS-5-CONFIG_I: ConFigurad from console by console

S1#

1.2.7 Implementar DHCP

1.2.8 Configurar servidor DHCP

7. Implement DHCP and NAT for IPv4
8. Configurar R1 como servidor DHCP para las VLANs 30 y 40.

Ahora excluimos las IPs que no queremos que el servidor le ofrezca a los clientes de los siguientes router:

BOGOTA>enable
BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip dhcp excluded-address 192.168.40.2 192.168.40.32
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA#

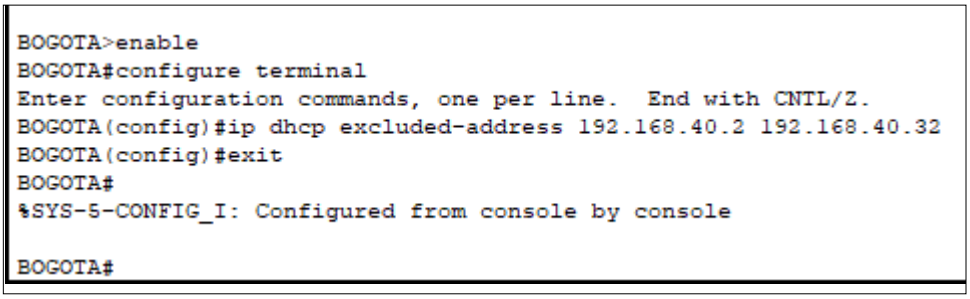


Figura 137 Configurar R1 como servidor DHCP para las VLANs 30 y 40.

- **Configuramos el router 1 R1 – Bogota.**

BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip dhcp pool ADMINISTRACION

BOGOTA(dhcp-config)#dns-server 10.10.10.11

BOGOTA(dhcp-config)#default-router 192.168.30.1

BOGOTA(dhcp-config)#network 192.168.30.0 255.255.255.0

BOGOTA(dhcp-config)#ip dhcp pool MERCADEO

BOGOTA(dhcp-config)#dns-server 10.10.10.11

BOGOTA(dhcp-config)#default-router 192.168.40.1

BOGOTA(dhcp-config)#network 192.168.40.0 255.255.255.0

BOGOTA(dhcp-config)#exit

BOGOTA(config)#exit

BOGOTA#

%SYS-5-CONFIG_I: ConFigurad from console by console

BOGOTA#

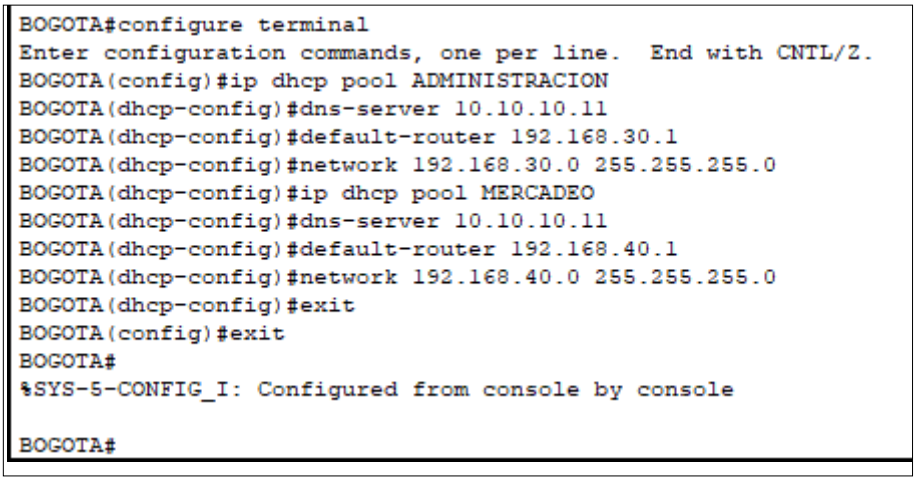


Figura 138 Configurar router BOGOTA

1.2.9 Reservar direcciones IP de las VLAN

9. Reservar las primeras 30 direcciones IP de las VLAN 30 y 40 para configuraciones estáticas.

Configurar DHCP pool para VLAN 30	Name: ADMINISTRACION DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.
Configurar DHCP pool para VLAN 40	Name: MERCADEO DNS-Server: 10.10.10.11 Domain-Name: ccna-unad.com Establecer default gateway.

- **Dominio ADMINISTRACION**

BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip dhcp pool ADMINISTRACION
BOGOTA(dhcp-config)#ip domain-name ccna-unad.com
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA#

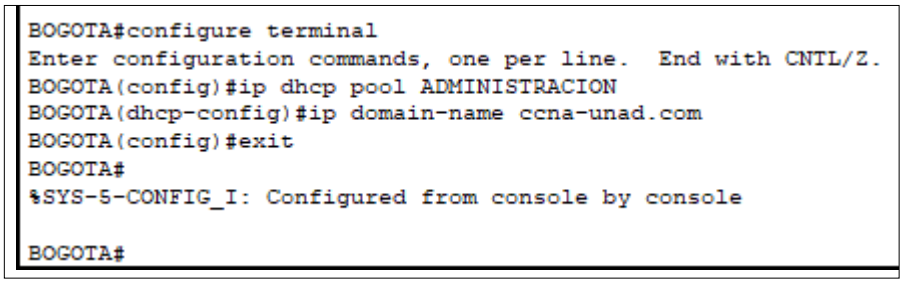


Figura 139 Configurar DHCP pool ADMINISTRACION

- **Dominio MERCADEO**

BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip dhcp pool MERCADEO
BOGOTA(dhcp-config)#ip domain-name ccna-unad.com
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: ConFigurad from console by console
BOGOTA#

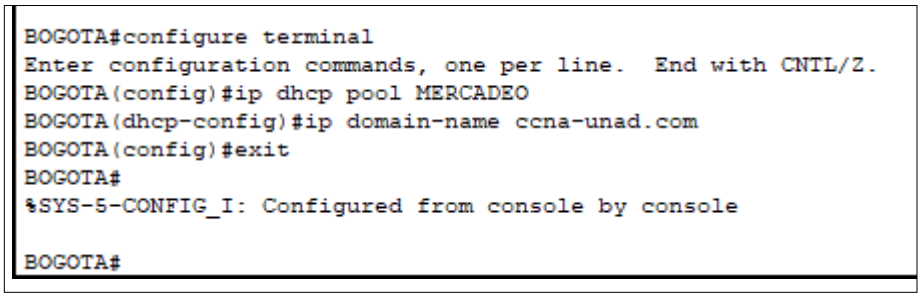


Figura 140 Configurar DHCP pool MERCADEO

- **Excluir IP**

BOGOTA#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BOGOTA(config)#ip dhcp excluded-address 192.168.31.1 192.168.31.30
BOGOTA(config)#no ip dhcp excluded-address 192.168.31.1 192.168.31.30
BOGOTA(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
BOGOTA(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
BOGOTA(config)#exit

BOGOTA#

```
BOGOTA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA(config)#ip dhcp excluded-address 192.168.31.1 192.168.31.30
BOGOTA(config)#no ip dhcp excluded-address 192.168.31.1 192.168.31.30
BOGOTA(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
BOGOTA(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console
```

Figura 141 Excluir IP router BOGOTA

1.2.10 Configurar NAT

10. Configurar NAT en R2 para permitir que los host puedan salir a internet

MIAMI>enable

MIAMI#conFigura terminal

Enter configuration commands, one per line. End with CNTL/Z.

MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.200.229

MIAMI(config)#int g0/0

%Invalid interface type and number

MIAMI(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask

% Incomplete command.

MIAMI(config)#255.255.255.248

^

% Invalid input detected at '^' marker.

MIAMI(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask

% Incomplete command.

```
MIAMI(config)#255.255.255.248
^
% Invalid input detected at '^' marker.
MIAMI(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228
netmask 255.255.255.248
MIAMI(config)#ip nat inside source list 1 pool INTERNET
MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.200.229
MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.20.229
MIAMI(config)#int g0/1
%Invalid interface type and number
MIAMI(config)#int s0/0/1
MIAMI(config-if)#ip nat inside
MIAMI(config-if)#exit
MIAMI(config)#int s0/0/1
MIAMI(config-if)#ip nat outside
MIAMI(config-if)#exit
MIAMI(config)#int s0/0/0
MIAMI(config-if)#ip nat inside
MIAMI(config-if)#exit
MIAMI(config)#int s0/0/0
MIAMI(config-if)#ip nat outside
MIAMI(config-if)#exit
MIAMI(config)#exit
MIAMI#
%SYS-5-CONFIG_I: ConFigurad from console by console
MIAMI#
```

```
MIAMI>enable
MIAMI#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.200.229
MIAMI(config)#int g0/0
%Invalid interface type and number
MIAMI(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask
% Incomplete command.
MIAMI(config)#255.255.255.248
               ^
% Invalid input detected at '^' marker.

MIAMI(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask
% Incomplete command.
MIAMI(config)#255.255.255.248
               ^
% Invalid input detected at '^' marker.

MIAMI(config)#ip nat pool INTERNET 209.165.200.225 209.165.200.228 netmask
255.255.255.248
MIAMI(config)#ip nat inside source list 1 pool INTERNET
MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.200.229
MIAMI(config)#ip nat inside source static 10.10.10.10 209.165.20.229
MIAMI(config)#int g0/1
%Invalid interface type and number
MIAMI(config)#int s0/0/1
MIAMI(config-if)#ip nat inside
MIAMI(config-if)#exit
MIAMI(config)#int s0/0/1
MIAMI(config-if)#ip nat outside
MIAMI(config-if)#exit
MIAMI(config)#int s0/0/0
MIAMI(config-if)#ip nat inside
MIAMI(config-if)#exit
MIAMI(config)#int s0/0/0
MIAMI(config-if)#ip nat outside
MIAMI(config-if)#exit
MIAMI(config)#exit
MIAMI#
%SYS-5-CONFIG_I: Configured from console by console
```

Figura 142 Configurar NAT en MIAMI

1.2.11 Configurar listas de acceso estándar

11. Configurar al menos dos listas de acceso de tipo estándar a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

Las listas de acceso de tipo estándar controlan el tráfico por la comparación de la dirección de origen de los paquetes IP con las direcciones configuradas en la ACL.

- **Lista de acceso estándar de R3 – Buenos Aires a R2 – Miami.**

```
BUENOSAIRES#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BUENOSAIRES(config)#ip access-list standard MANTENIMIENTO
BUENOSAIRES(config-std-nacl)#permit host 172.31.21.1
BUENOSAIRES(config-std-nacl)#permit host 172.31.23.2
BUENOSAIRES(config-std-nacl)#exit
BUENOSAIRES(config)#line vty 0 4
BUENOSAIRES(config-line)#access-class MANTENIMIENTO in
BUENOSAIRES(config-line)#exit
BUENOSAIRES(config)#exit
BUENOSAIRES#
%SYS-5-CONFIG_I: ConFigurad from console by console

BUENOSAIRES#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BUENOSAIRES#
```

```
[OK]
BUENOSAIRES#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BUENOSAIRES(config)#ip access-list standard MANTENIMIENTO
BUENOSAIRES(config-std-nacl)#permit host 172.31.21.1
BUENOSAIRES(config-std-nacl)#permit host 172.31.23.2
BUENOSAIRES(config-std-nacl)#exit
BUENOSAIRES(config)#line vty 0 4
BUENOSAIRES(config-line)#access-class MANTENIMIENTO in
BUENOSAIRES(config-line)#exit
BUENOSAIRES(config)#exit
BUENOSAIRES#
%SYS-5-CONFIG_I: Configured from console by console

BUENOSAIRES#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BUENOSAIRES#
```

Figura 143 Listas de acceso estándar BUENOSAIRESA - MIAMI

1.2.12 Configurar listas de acceso extendido

12. Configurar al menos dos listas de acceso de tipo extendido o nombradas a su criterio en para restringir o permitir tráfico desde R1 o R3 hacia R2.

Las listas de acceso extendidas controlan el tráfico por la comparación de las direcciones de origen y de destino de los paquetes IP a las direcciones configuradas en la ACL.

- **Lista de acceso extendido de R3 – Buenos Aires a R2 – Miami.**

BUENOSAIRES#conFigura terminal
Enter configuration commands, one per line. End with CNTL/Z.
BUENOSAIRES(config)#access-list 101 permit tcp any host 209.165.200.229 eq www
BUENOSAIRES(config)#access-list 101 permit icmp any any echo-reply
BUENOSAIRES(config)#interface g0/0
%Invalid interface type and number

```
BUENOSAIRES(config)#interface f0/0
BUENOSAIRES(config-if)#ip access-group 101 in
BUENOSAIRES(config-if)#interface s0/0/1
BUENOSAIRES(config-if)#ip access-group 101 out
BUENOSAIRES(config-if)#interface s0/0/0
BUENOSAIRES(config-if)#ip access-group 101 out
BUENOSAIRES(config-if)#interface f0/1
BUENOSAIRES(config-if)#ip access-group 101 out
BUENOSAIRES(config-if)#exit
BUENOSAIRES(config)#exit
BUENOSAIRES#
%SYS-5-CONFIG_I: ConFigurad from console by console

BUENOSAIRES#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BUENOSAIRES#
```

```
BUENOSAIRES#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BUENOSAIRES(config)#access-list 101 permit tcp any host 209.165.200.229 eq www
BUENOSAIRES(config)#access-list 101 permit icmp any any echo-reply
BUENOSAIRES(config)#interface g0/0
%Invalid interface type and number
BUENOSAIRES(config)#interface f0/0
BUENOSAIRES(config-if)#ip access-group 101 in
BUENOSAIRES(config-if)#interface s0/0/1
BUENOSAIRES(config-if)#ip access-group 101 out
BUENOSAIRES(config-if)#interface s0/0/0
BUENOSAIRES(config-if)#ip access-group 101 out
BUENOSAIRES(config-if)#interface f0/1
BUENOSAIRES(config-if)#ip access-group 101 out
BUENOSAIRES(config-if)#exit
BUENOSAIRES(config)#exit
BUENOSAIRES#
%SYS-5-CONFIG_I: Configured from console by console

BUENOSAIRES#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BUENOSAIRES#
```

Figura 144 Listas de acceso extendido BUENOSAIRESA - MIAMI

1.2.13 Verificación de comunicación y redireccionamiento de tráfico

13. Verificar procesos de comunicación y redireccionamiento de tráfico en los routers mediante el uso de Ping y Traceroute.

- **Ping del R1 – BOGOTA a la VLAN 30 Administración:**

BOGOTA>enable

BOGOTA#ping 192.168.30.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.30.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/7/12 ms

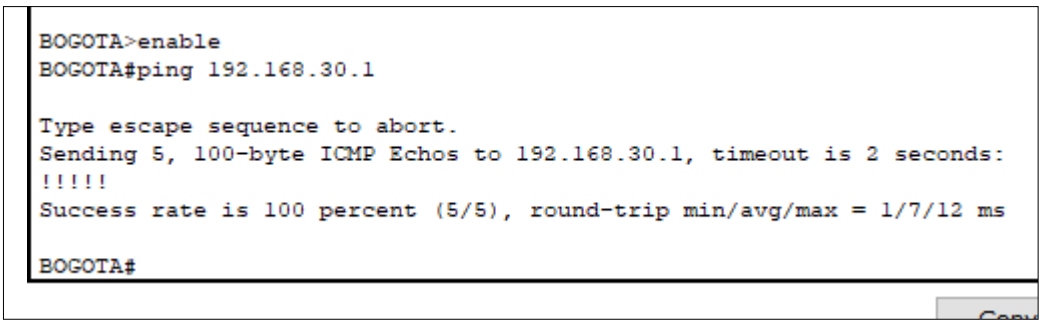


Figura 145 Ping BOGOTA a la VLAN 30 Administración

- **Ping del R1 – BOGOTA a la VLAN 40 Mercadeo:**

BOGOTA#ping 192.168.40.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.40.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 7/8/11 ms
BOGOTA#

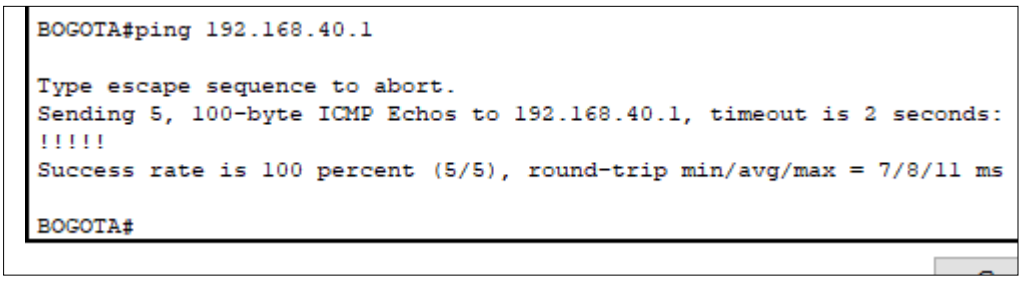


Figura 146 Ping BOGOTA a la VLAN 40 Mercadeo

- **Ping del R1 – BOGOTA a la VLAN 40 Mantenimiento:**

BOGOTA#ping 192.168.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 9/10/11 ms
BOGOTA#

```
BOGOTA#ping 192.168.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.200.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 9/10/11 ms

BOGOTA#
```

Figura 147 BOGOTA a la VLAN 40 Mantenimiento

- **Interfaces del R2 - Miami**

```
MIAMI>enable
MIAMI#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol

FastEthernet0/0        209.165.200.230 YES manual up                    up

FastEthernet0/1        10.10.10.1      YES manual up                    up

Serial0/0/0            172.31.23.1     YES manual up                    up

Serial0/0/1            172.31.21.2     YES manual up                    up
```

Figura 148 Interfaces router MIAMI

2. LISTA DE TABLAS

3. LISTA DE FIGURAS

4. ANEXOS

Anexo A. Escenario 1 en Packet Tracer.

https://1drv.ms/u/s!AobzALF3POJRiU-SJv1i44fFHbVM

Anexo B. Escenario 2 en Packet Tracer.

https://1drv.ms/u/s!AobzALF3POJRiU6IstRbfPGj9_0z

5. CONCLUSIONES

- Configurar y aplicar el enrutamiento de cada uno de los dispositivos y su puesta en marcha y verificación mediante los comandos.

- Definir el direccionamiento de las IP según los lineamientos establecidos.

- Aplicar las configuraciones NAT en el router mediante comandos, verificando dicha configuración sobre su aplicabilidad.

- Configurar las listas de control de acceso (ACL) para permitir el acceso de direcciones IP específicas, de esta manera se asegura que solo la computadora del administrador tenga permiso para acceder al router.

- Implementar DHCP en los router correspondiente para que actúen como servidor el cual es el eje de la administración de las direcciones IP de la red.

- Desarrollar los dos escenarios bajo Packet Tracer, garantizaron la apropiación de los temas propuestos en este diplomado de profundización.

- A pesar de las adversidades se permitió cada uno de los conocimientos básicos y avanzados para llevar a cabo la elaboración de los diseños de red.

6. REFERENCIAS BIBLIOGRÁFICAS

- Temática: Introducción a redes conmutadas CISCO. (2014). Introducción a redes conmutadas. Principios de Enrutamiento y Conmutación.

  Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module1/index.html#1.0.1.1

- Temática: Configuración y conceptos básicos de Switching CISCO. (2014). Configuración y conceptos básicos de Switching. Principios de Enrutamiento y Conmutación.

  Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module2/index.html#2.0.1.1

- Temática: VLANs CISCO. (2014). VLANs. Principios de Enrutamiento y Conmutación. Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module3/index.html#3.0.1.1

- Temática: Conceptos de Routing CISCO. (2014). Conceptos de Routing. Principios de Enrutamiento y Conmutación.

  Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module4/index.html#4.0.1.1

- Temática: Enrutamiento entre VLANs CISCO. (2014). Enrutamiento entre VLANs. Principios de Enrutamiento y Conmutación. Recuperado

de https://static-courseassets.s3.amazonaws.com/RSE50ES/module5/index.html#5.0.1.1

- Temática: Enrutamiento Estático CISCO. (2014). Enrutamiento Estático. Principios de Enrutamiento y Conmutación. Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module6/index.html#6.0.1.1

- Temática: Enrutamiento Dinámico CISCO. (2014). Enrutamiento Dinámico. Principios de Enrutamiento y Conmutación. Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module7/index.html#7.0.1.1

- Temática: OSPF de una sola área CISCO. (2014). OSPF de una sola área. Principios de Enrutamiento y Conmutación. Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module8/index.html#8.0.1.1

- Temática: Listas de control de acceso CISCO. (2014). Listas de control de acceso. Principios de Enrutamiento y Conmutación. Recuperado de https://static-courseassets.s3.amazonaws.com/RSE50ES/module9/index.html#9.0.1.1